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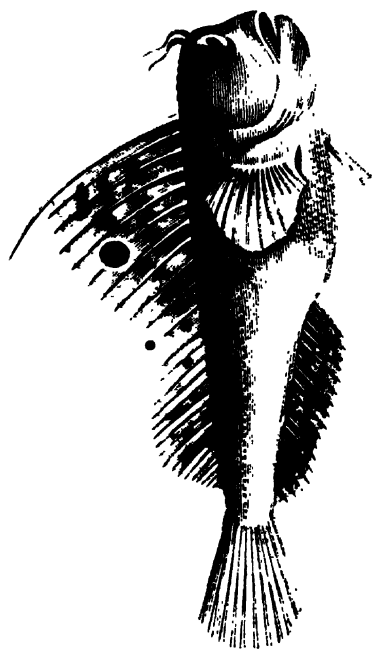
LITERATURE, SCIENCE, AND ART.

VOLUME III.

LONDON,

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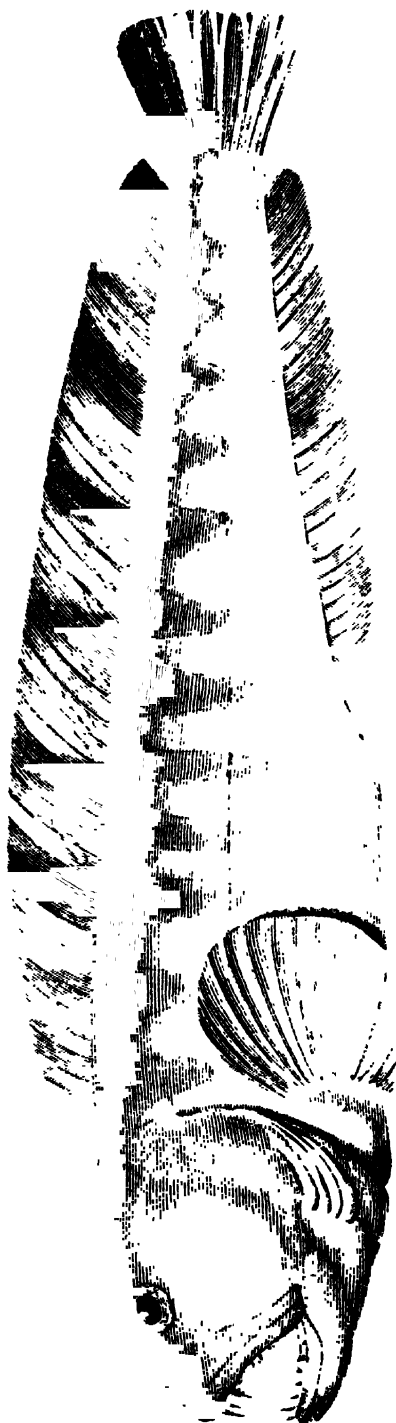
EDINBURGH, AND GLASGOW



Butterfly fish



Bandfish.

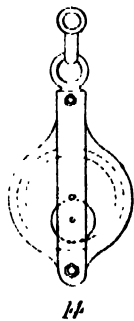
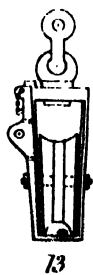
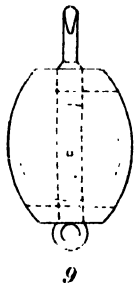
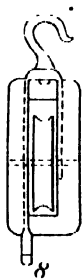
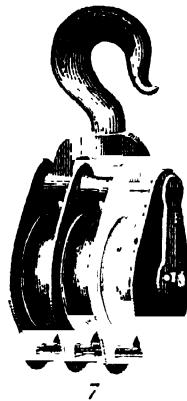
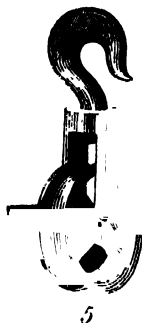


Wolf fish

B L O C K S .



Snatch



Leading Block .



Wood Block .



Iron Block .

Elibron Classics series.

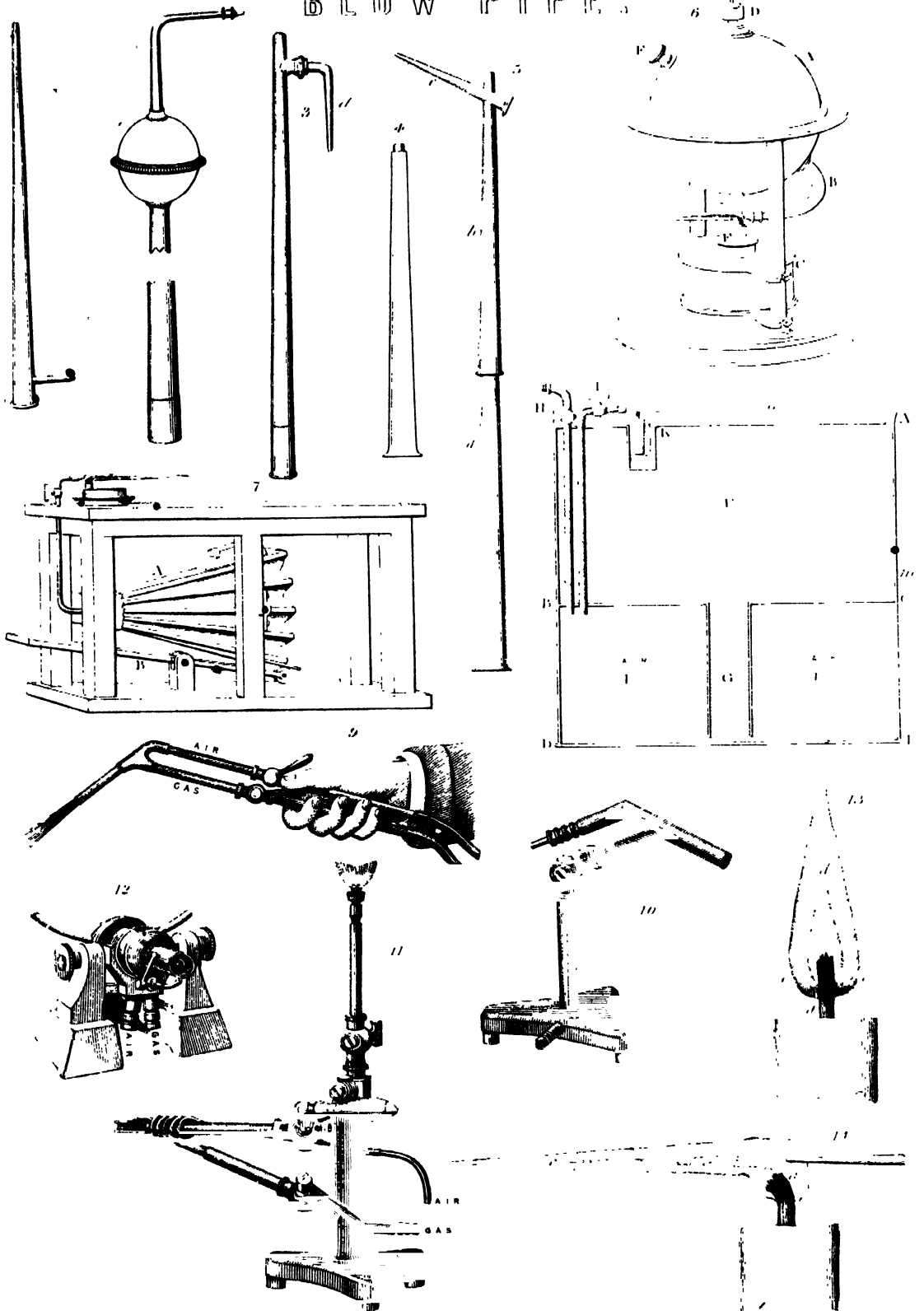
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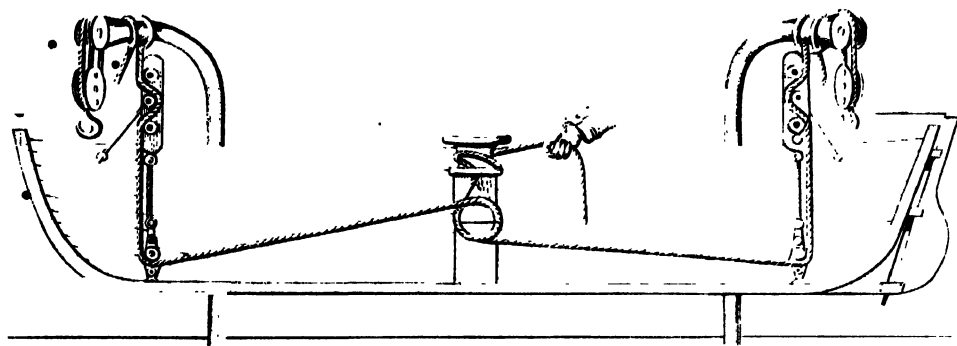
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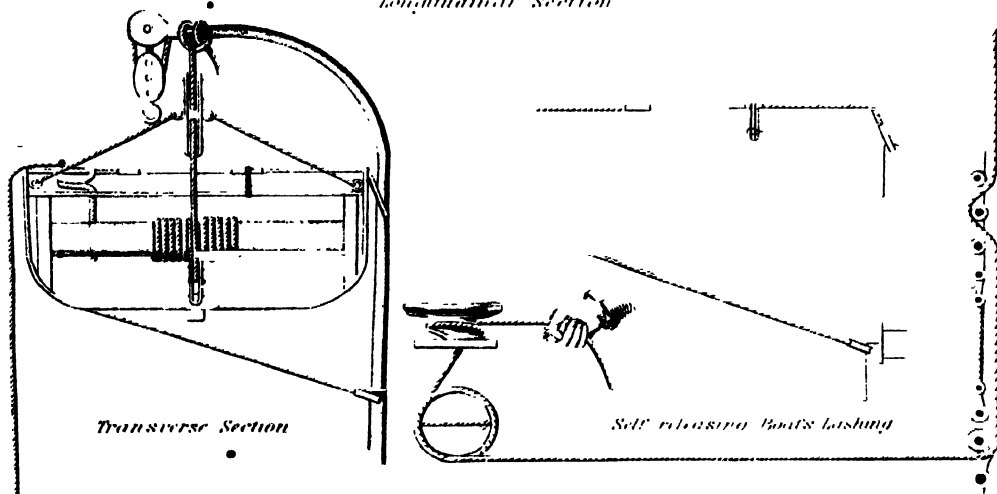
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BLOW PIPE.





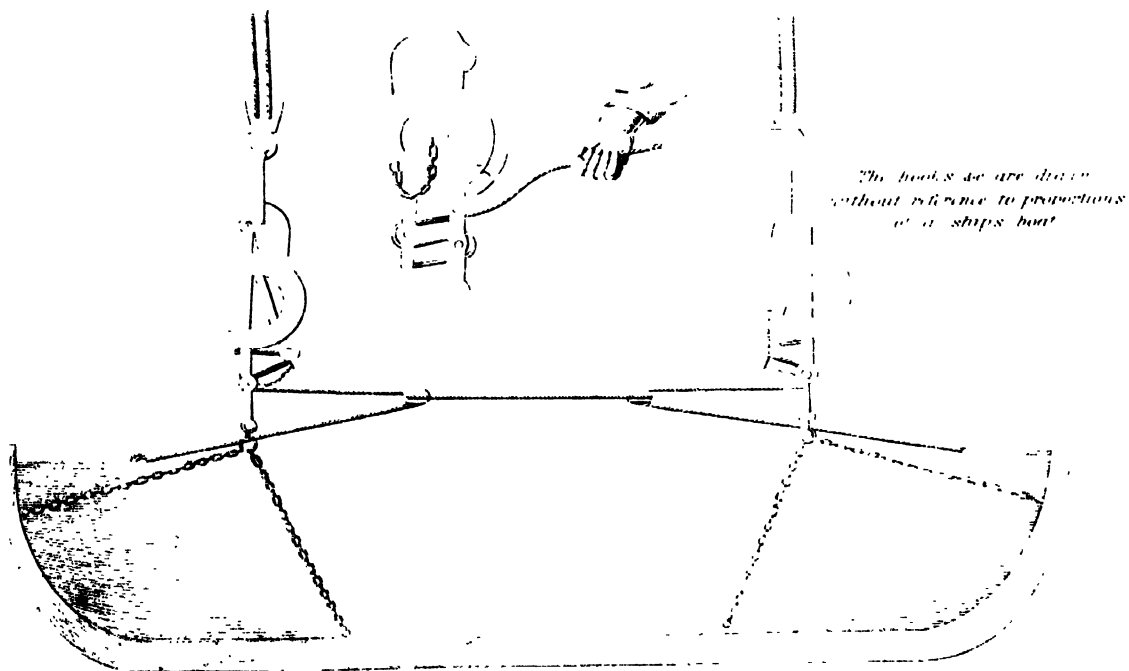
Longitudinal Section



Transverse Section

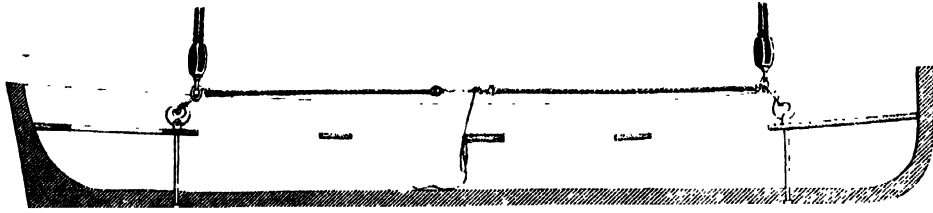
Self-releasing Boat's Lashing

1. Clifford's Boat-Lowering Apparatus

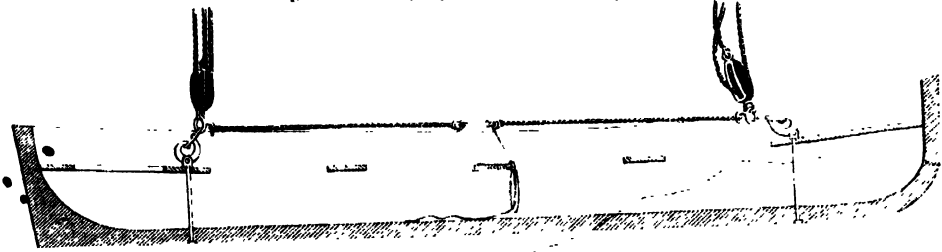


*The hooks are drawn
without reference to projections
of a ship's boat*

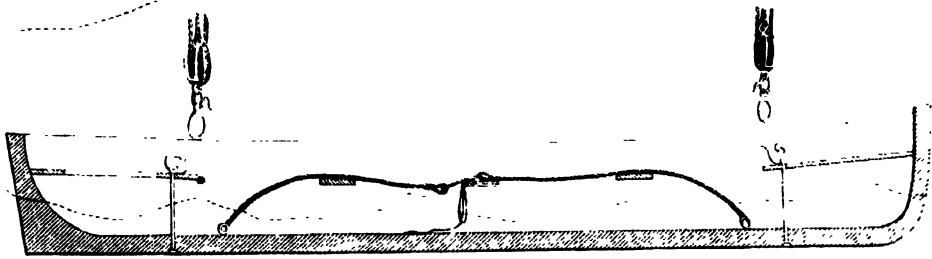
2. "Kynaston's Slip-Hooks."



Showing boat hanging at davits ready for lowering.



Showing bow of boat struck by sea: neither end yet disengaged. Dotted line shows water line.



Showing boat waterborne both falls clear safety line also disengaged.



Hook & ring attached cord strained.



Hook & ring detached cord having been slackened.

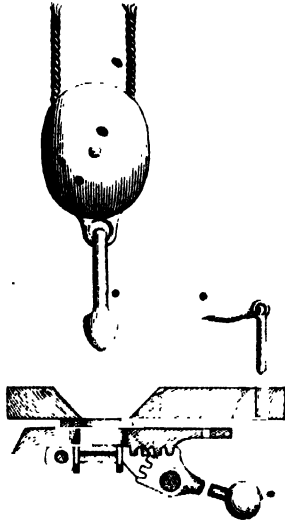
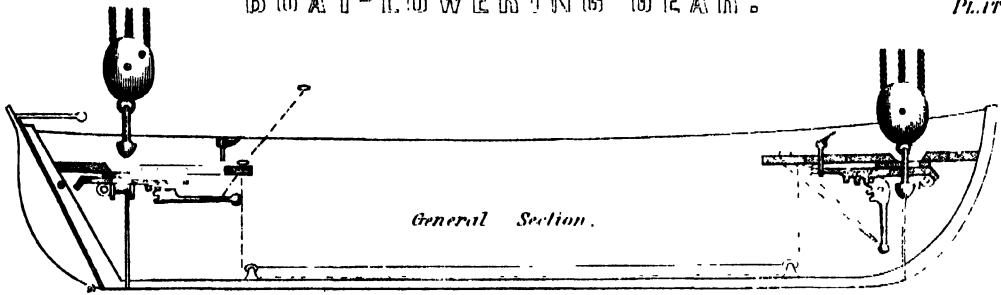


Hook & ring attached F hook or ring of lower tackle. Hook B, shackle to which slings of boat are attached.

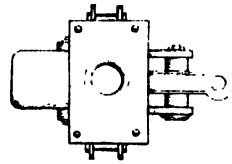
The hook A with the lock K, thrown back, which is used for securing the ring in the hook, when attached: P, shows pin for attaching the unlocking cord.



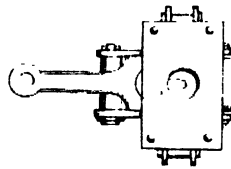
Ring B with hook A, and tackle line.



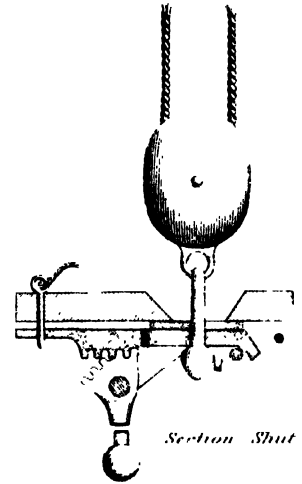
Section-Open.



Plan-Open

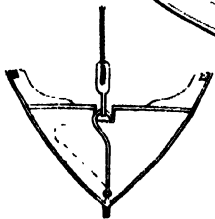
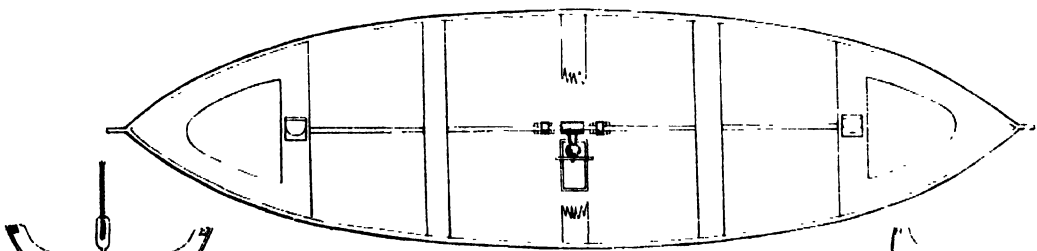


Plan-Shut

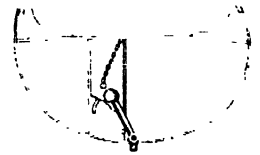


Section-Shut

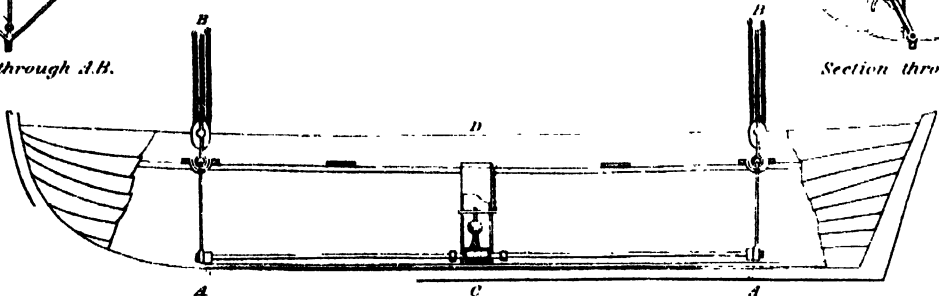
4. "Carpenter's Patent" Boat-Detaching gear.



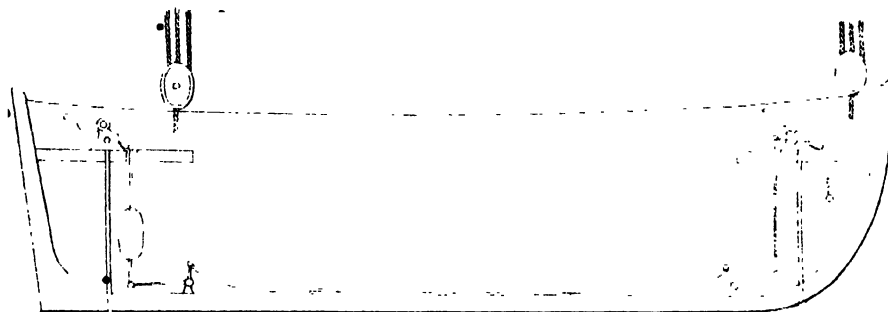
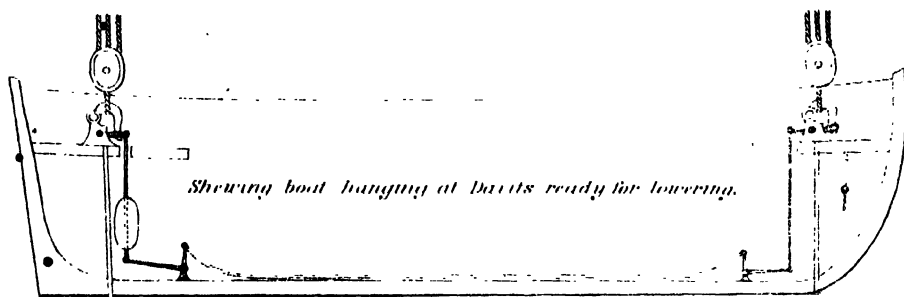
Section through A.B.



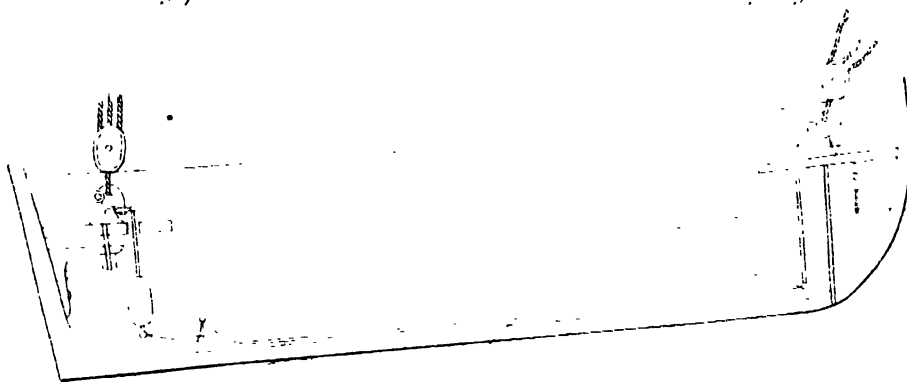
Section through C.D.



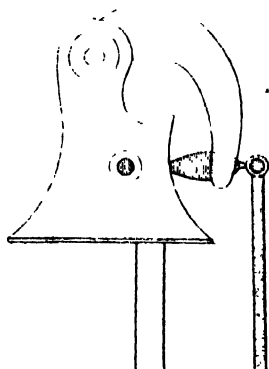
5. Leeman's Patent Automatic Ship's Boat Releasing Apparatus.



Showing position of gear when the boat is water borne at any angle.

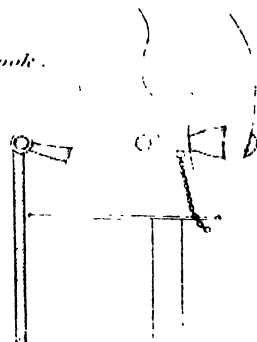


Showing one end of the boat struck by a sea both hooks hold fast

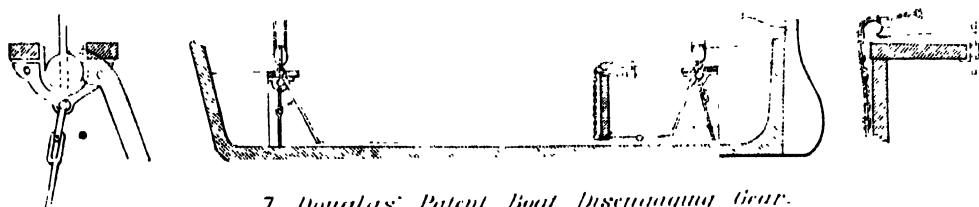


Stern Hook.

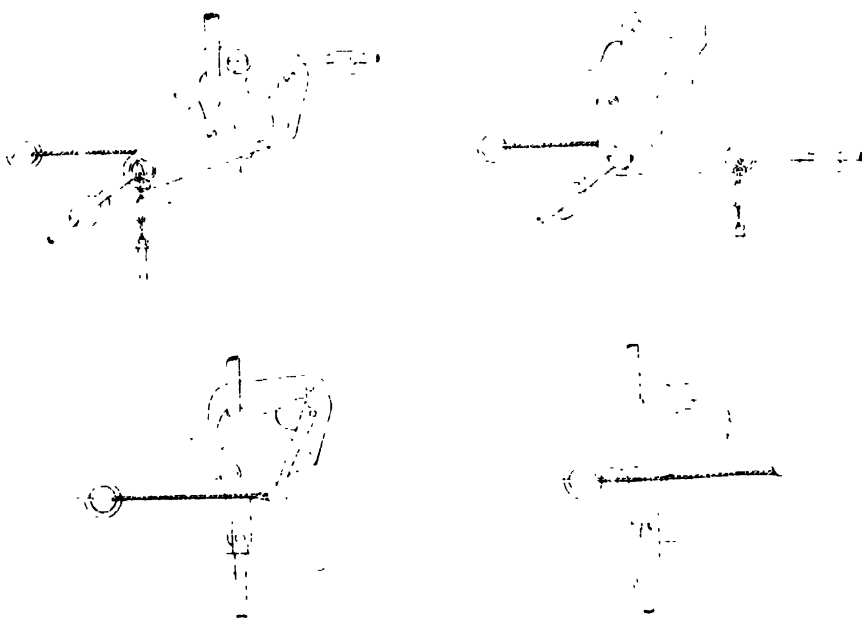
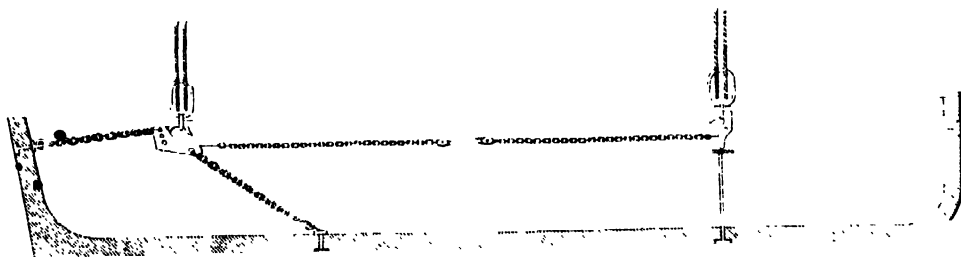
Head Hook.



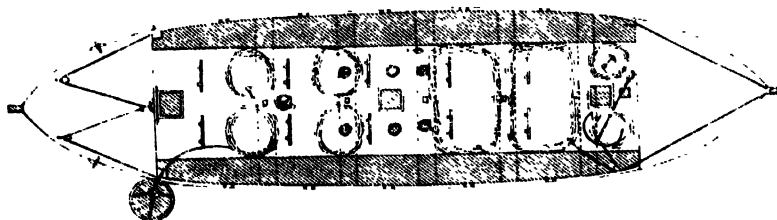
6. Sample & Ward's "Automatic Detaching Gear"



7. Douglas's Patent Boat Disengaging Gear.



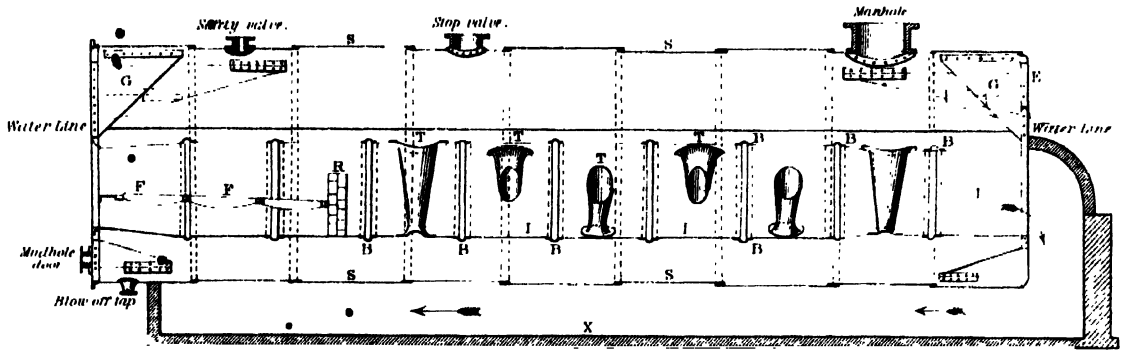
8. Robinson's Patent Disengaging Gear.



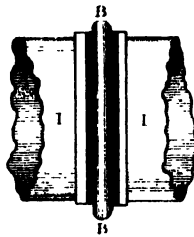
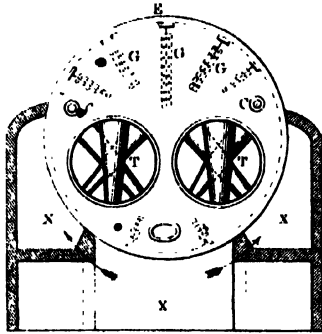
LIFE BOAT

9. Deck Plan and Gear of Self-Righting Life Boat

B O I L E R .

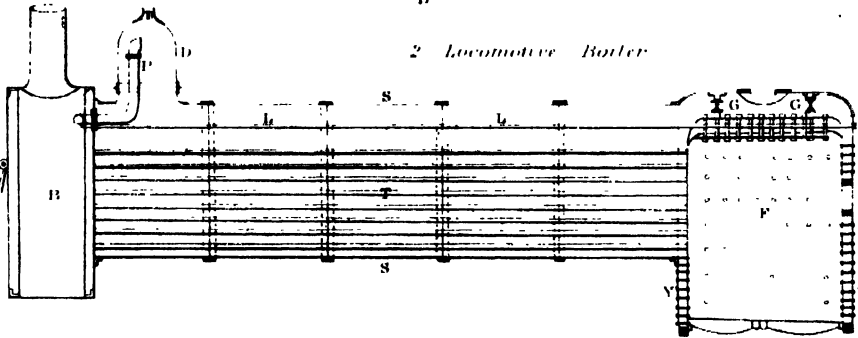


1 Lancashire Boiler



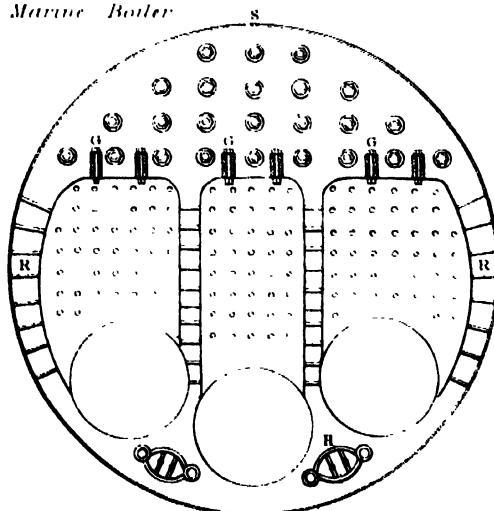
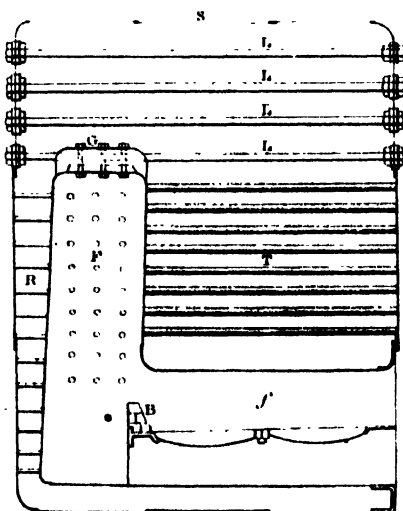
- S Boiler Shell
- E Boiler Head
- G Gussor Stays
- I Internal flues
- X External flues
- T Galloway tubes
- B Boiling rings
- F Furnace
- R Bridge
- I Feed valve
- C Steam cock

2 Locomotive Boiler

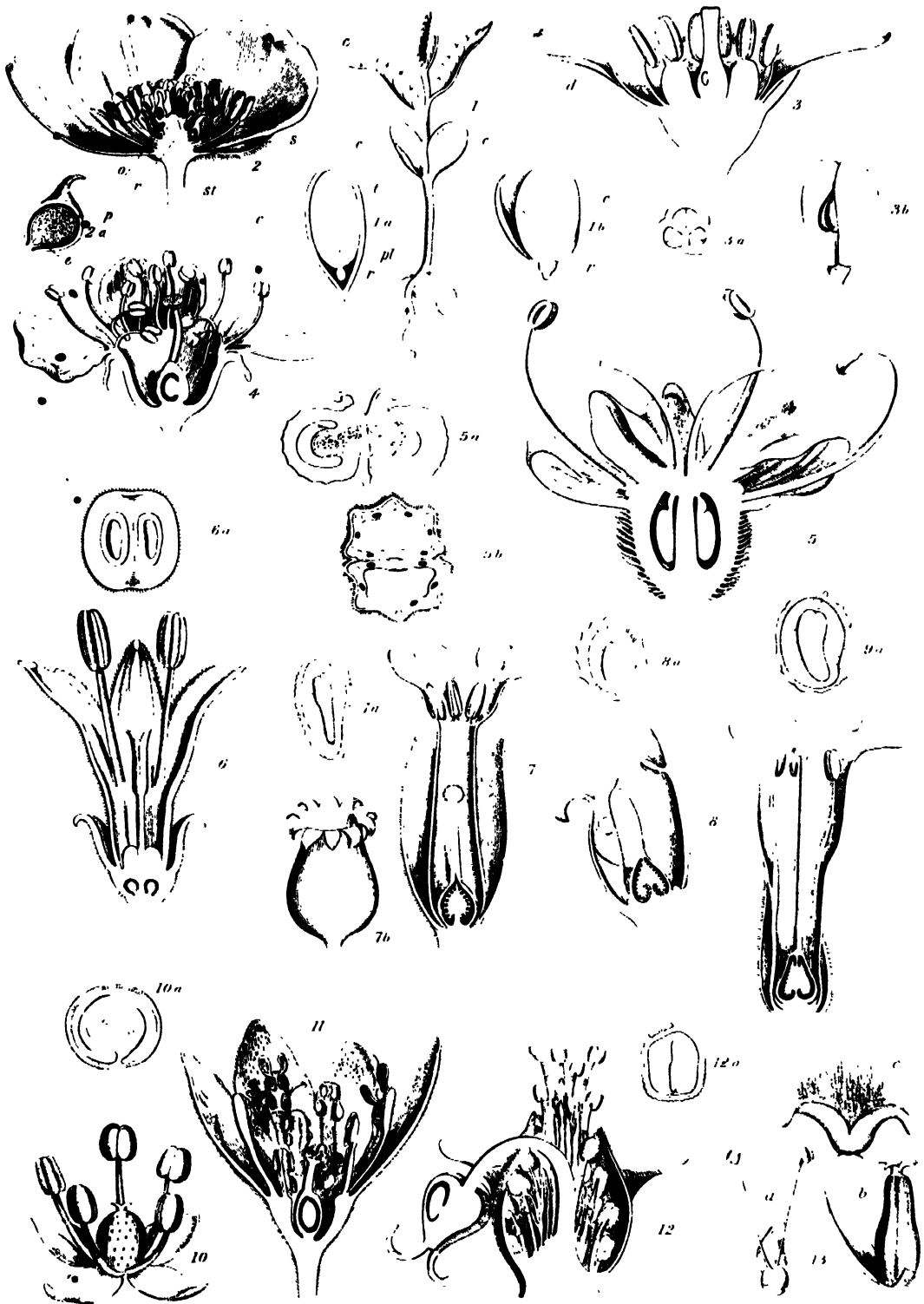


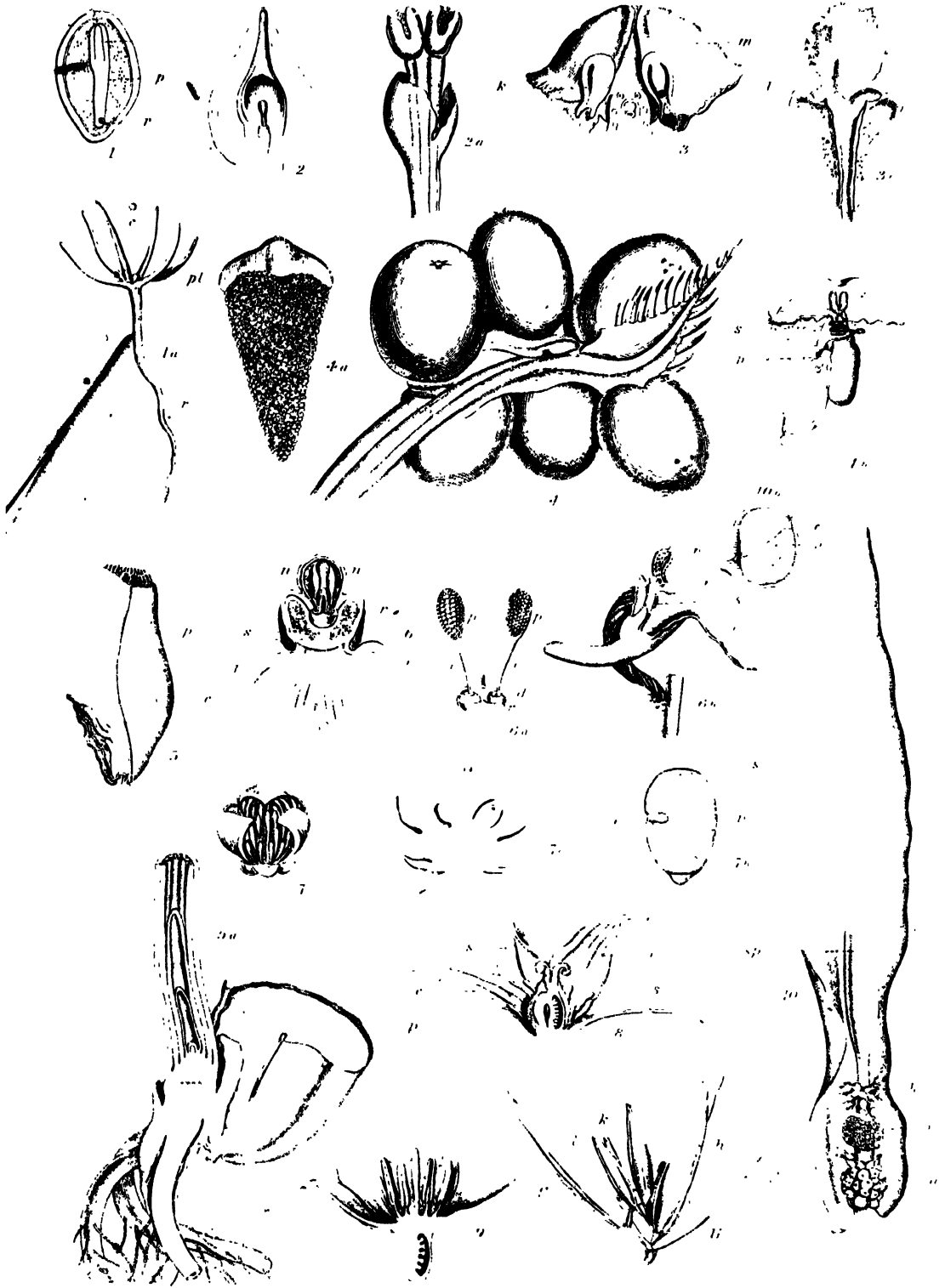
- S boiler Shell
- F Fire box
- D Steam dome
- P Steam pipe
- B Smoke box
- G Girders
- Y Stays
- T Tubes
- L Long stay

3 Marine Boiler



- S Boiler Shell
- F Fire box
- G Girders
- L Long stays
- J Furnace
- R Bridge
- T Tubes
- R Stays
- H Mudhole door





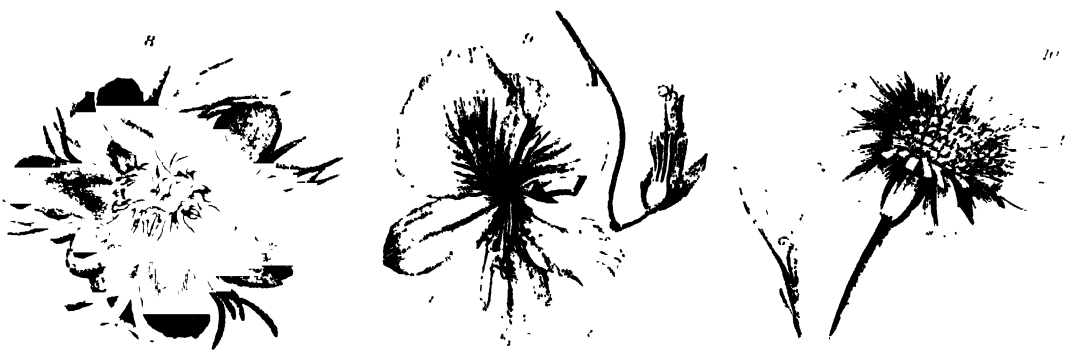


Fig. 2

- a Superior view of brain
- b Medulla
- c Pons
- d Cerebellum
- e Spinal cord
- f Band of white matter
- g White matter
- h Gray matter
- i Central sulcus
- k Cortical sulcus
- l Sulcus
- m Fissure
- n Fissure
- o Cerebral sulcus
- p Cerebral sulcus
- q Cerebral sulcus
- r Cerebral sulcus
- s Cerebral sulcus
- t Cerebral sulcus
- u Cerebral sulcus
- v Cerebral sulcus
- w Cerebral sulcus
- x Cerebral sulcus
- y Cerebral sulcus
- z Cerebral sulcus

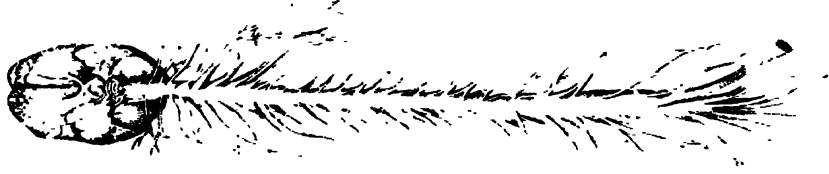
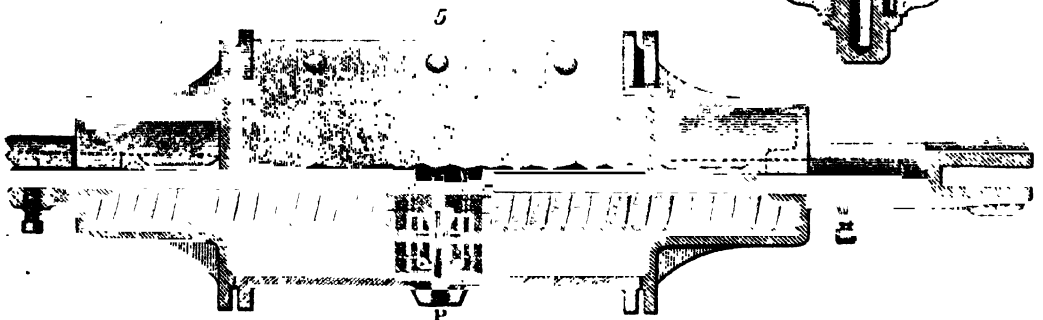
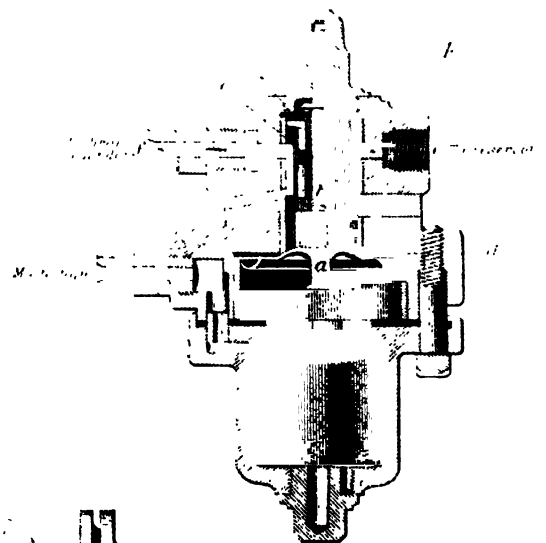
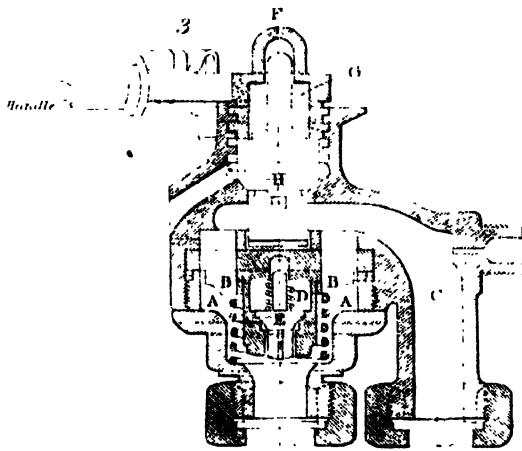
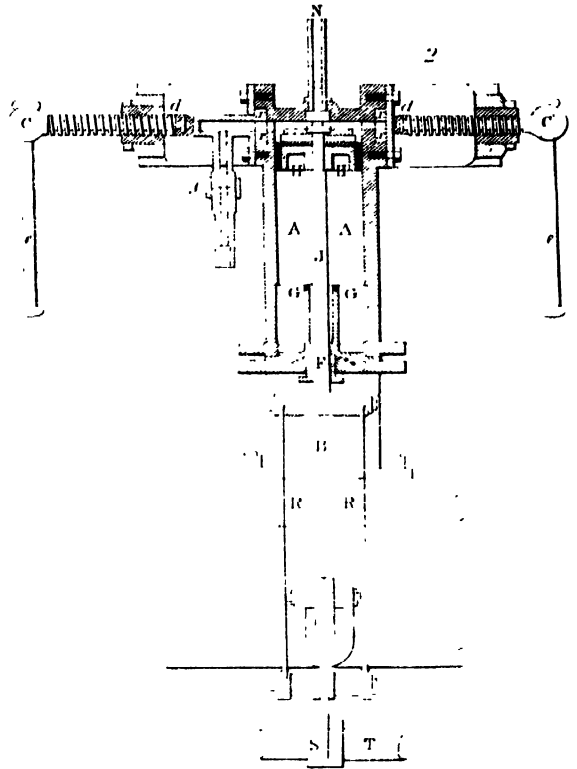
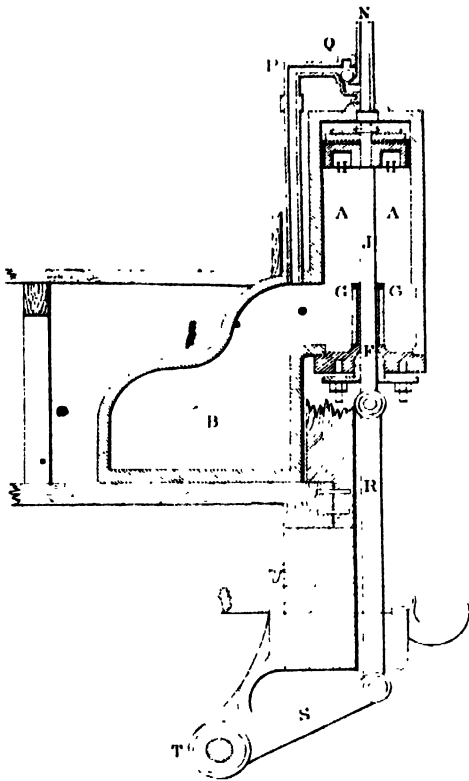
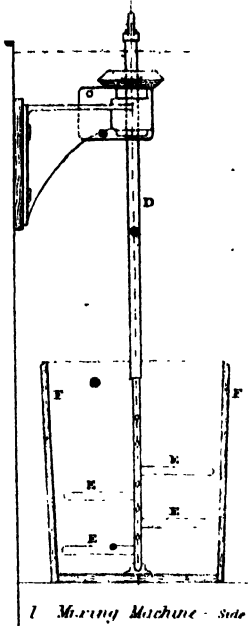


Fig. 2

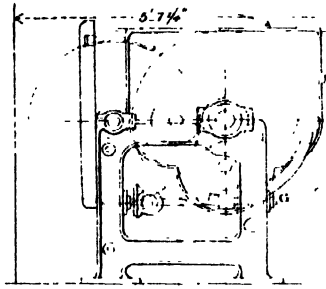
- a Brain
- b Lobes of brain
- c Medulla oblongata
- d Spinal cord
- e Cerebral plexus
- f Cerebral do.
- g Cerebral do.
- h Cerebral do.
- i Cerebral do.
- j Cerebral do.
- k Cerebral do.
- l Cerebral do.
- m Cerebral do.
- n Cerebral do.
- o Cerebral do.
- p Cerebral do.
- q Cerebral do.
- r Cerebral do.
- s Cerebral do.
- t Cerebral do.
- u Cerebral do.
- v Cerebral do.
- w Cerebral do.
- x Cerebral do.
- y Cerebral do.
- z Cerebral do.



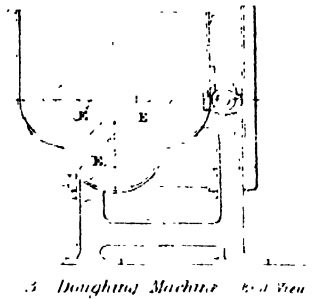
B R E A (D) n



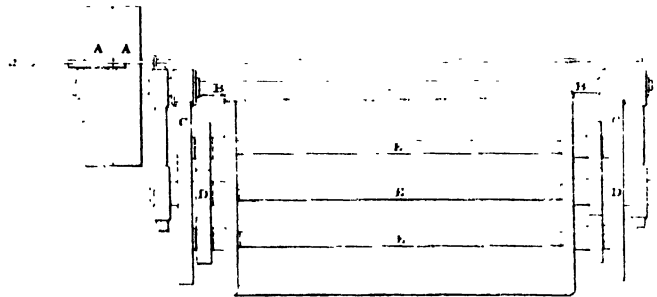
1 *Mixing Machine - Side View*



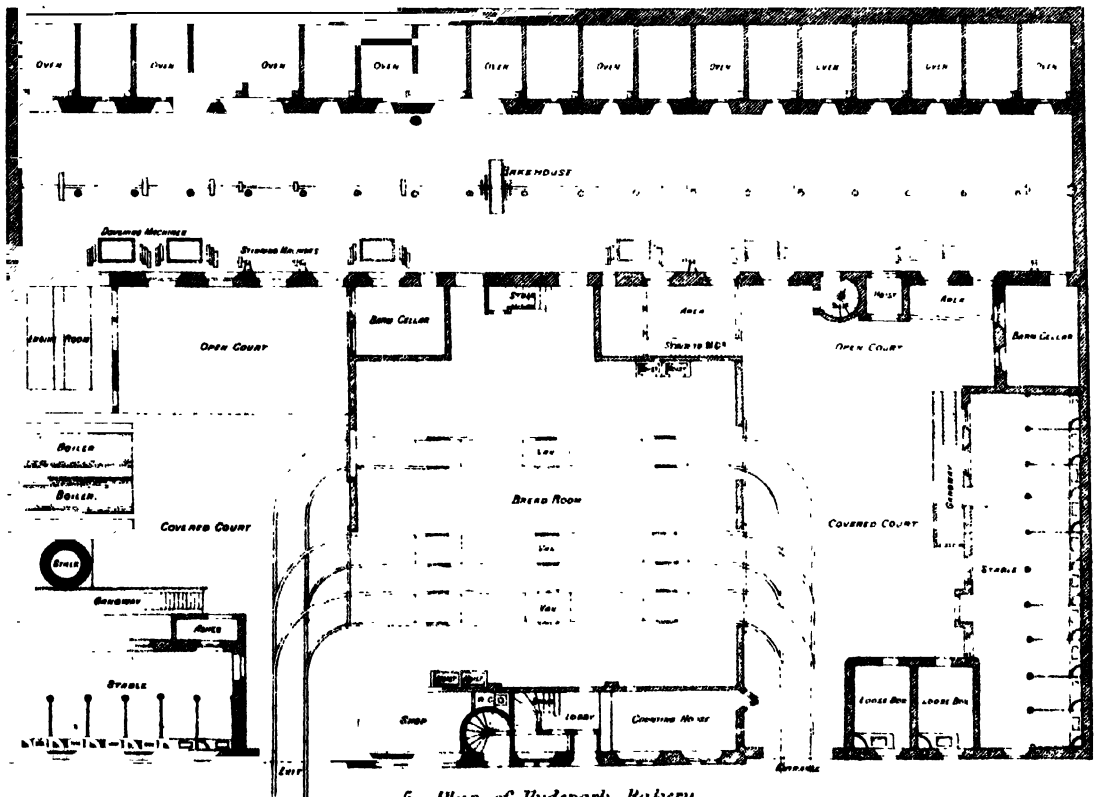
2. Doughing Machine - End View



3. Doughnut Machine End View



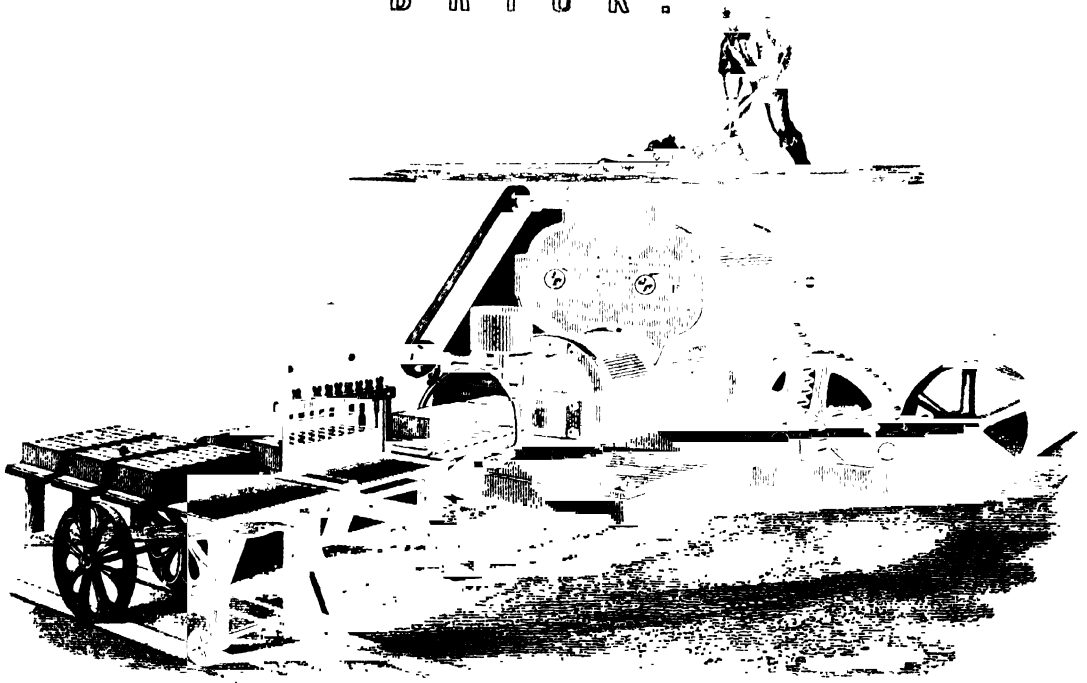
Photographic Machine 111



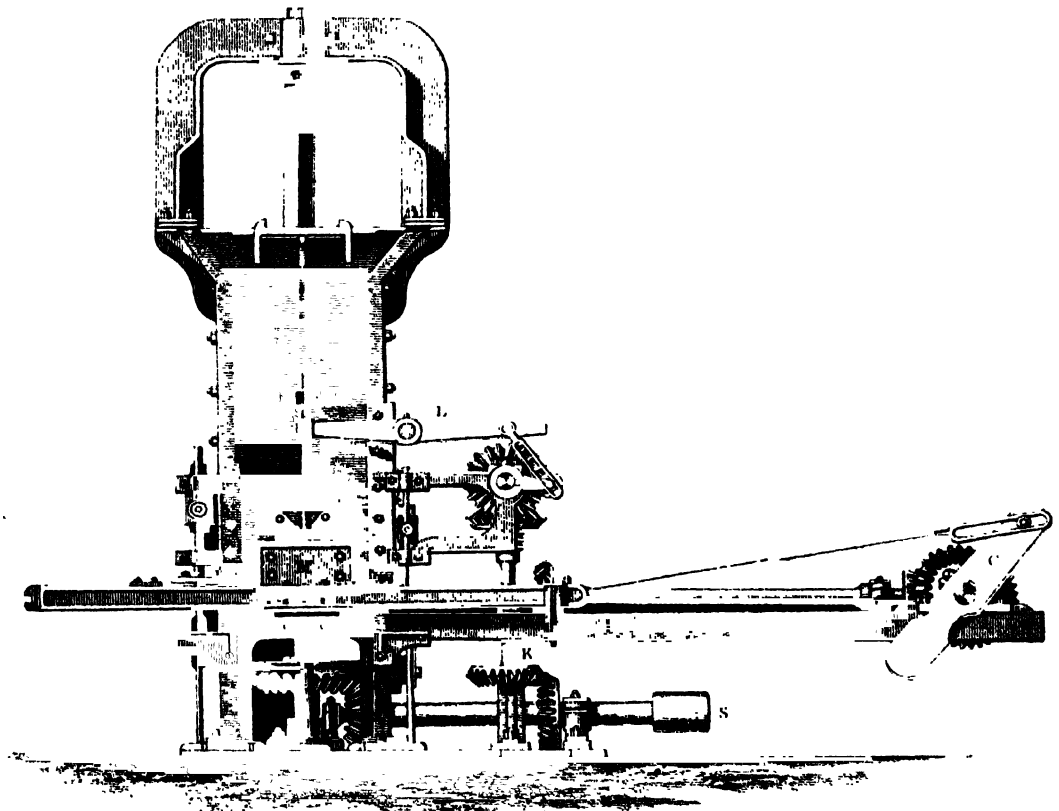
5. Plan of Hydepark Bakery.

Mess^{rs} Bruce & Hay, architects.

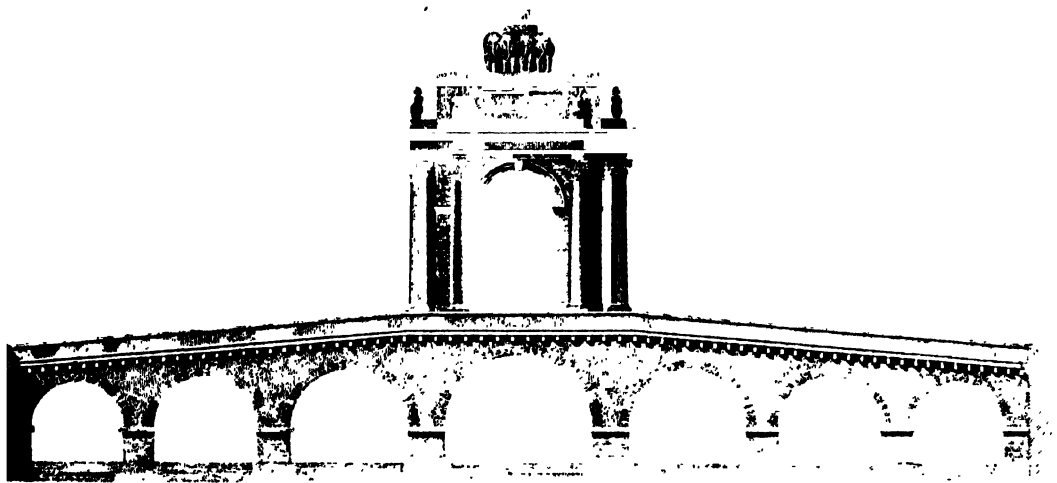
BRICK.



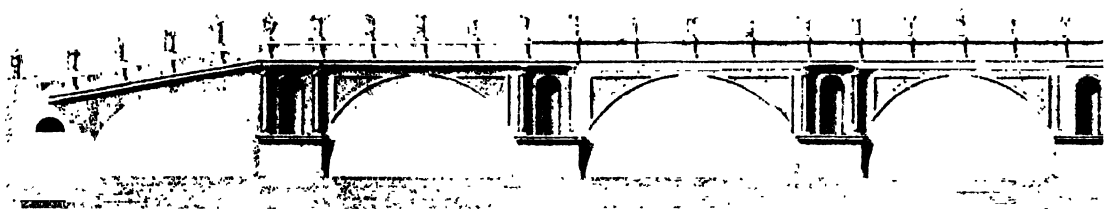
1. Clayton, Howlett & Venable's Brick Making Machine



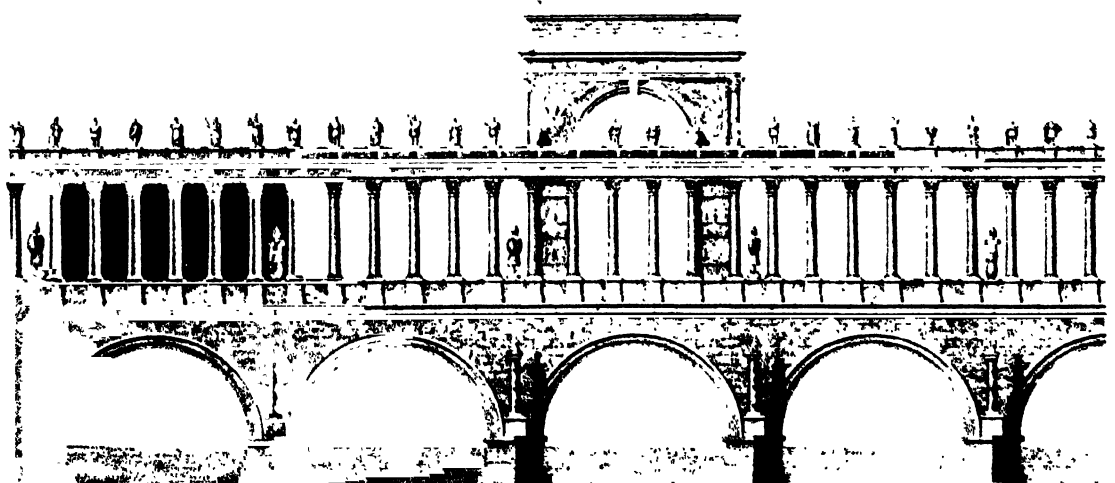
2. Ralston & Sons' Brick Making Machine



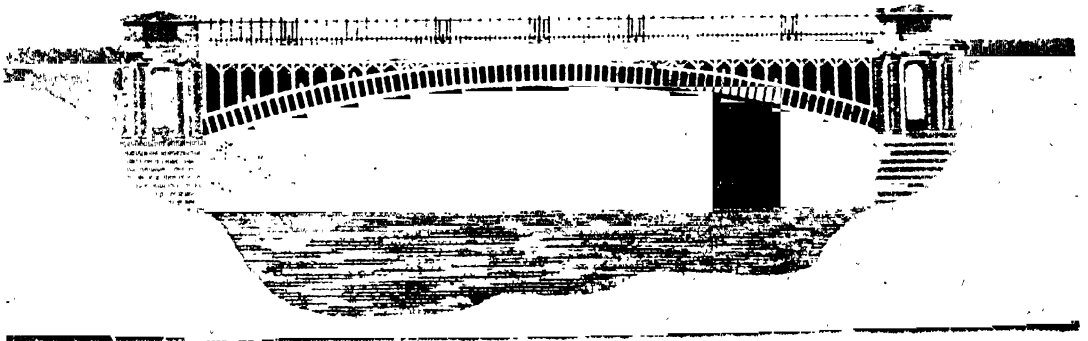
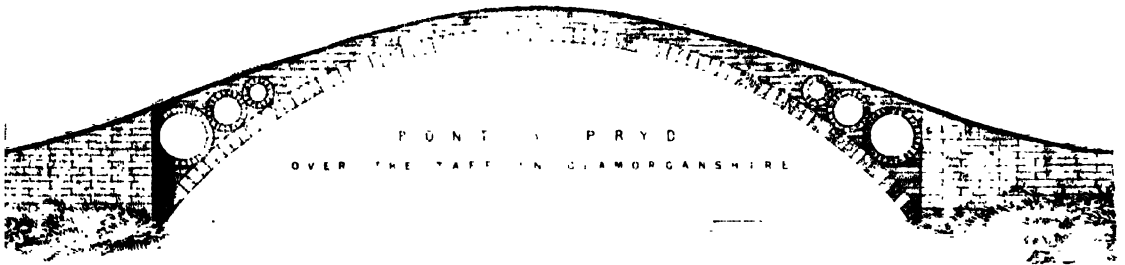
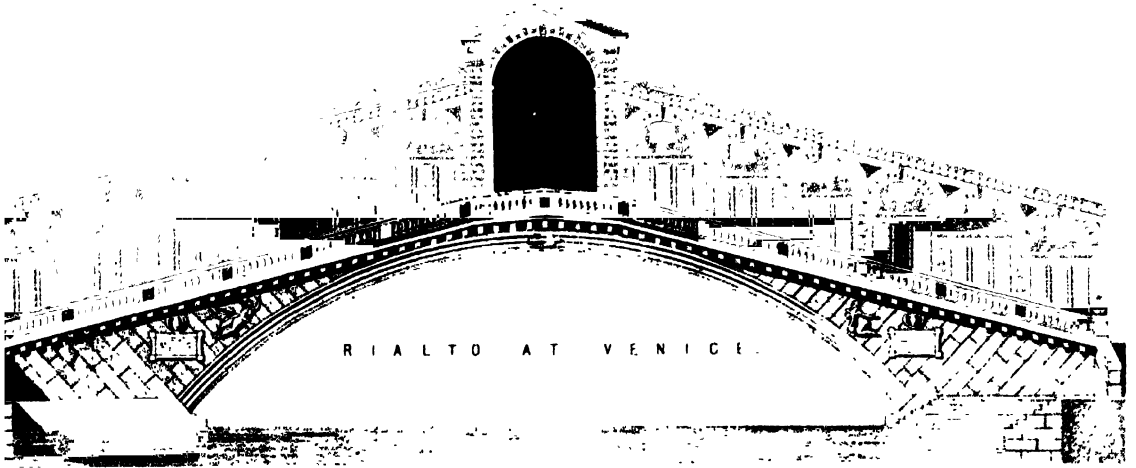
TRIUMPHAL BRIDGE OF AUGUSTUS AT RIMINI



SENATORIAN BRIDGE AT ROME



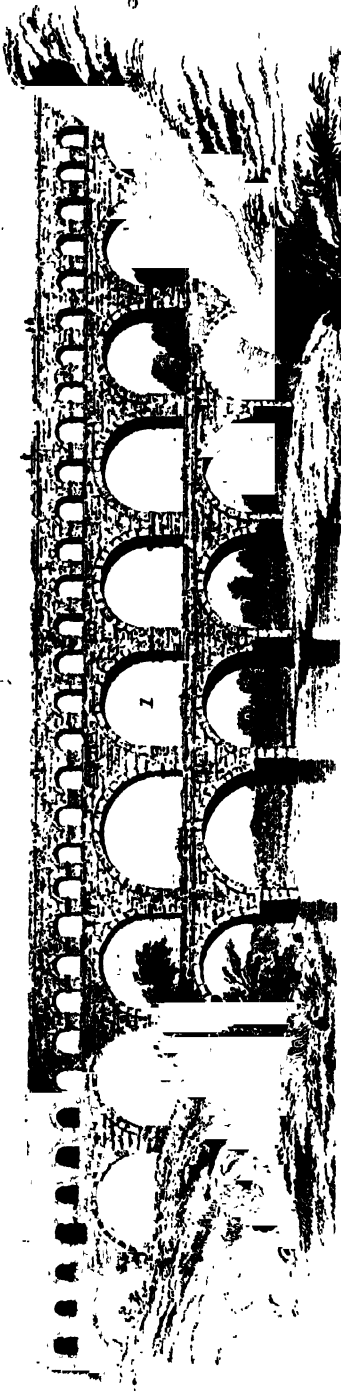
TRIUMPHAL BRIDGE AT ROME.



BRIDGE.

PLATE 3.

*The Pont du Gard,
Roman Aqueduct near Nîmes.*



*Wooden Bridge over the Cismone,
by Palladio.*

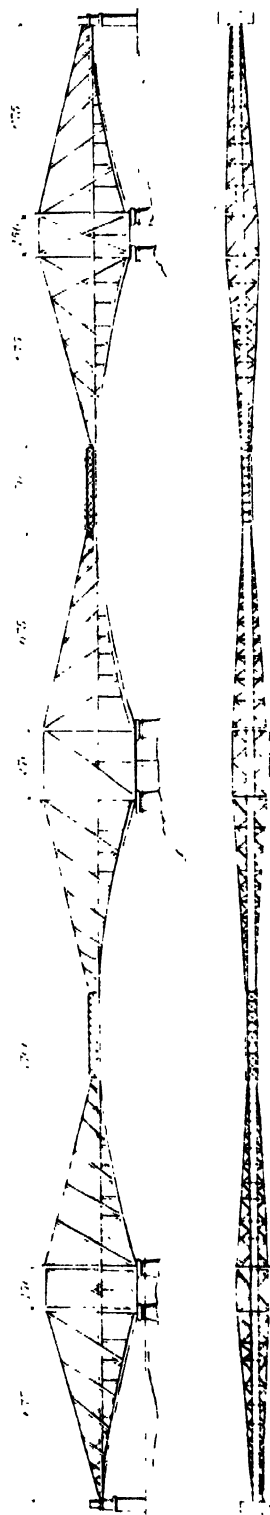


*Suspension Bridge between New York & Brooklyn,
Opened, 1863.*

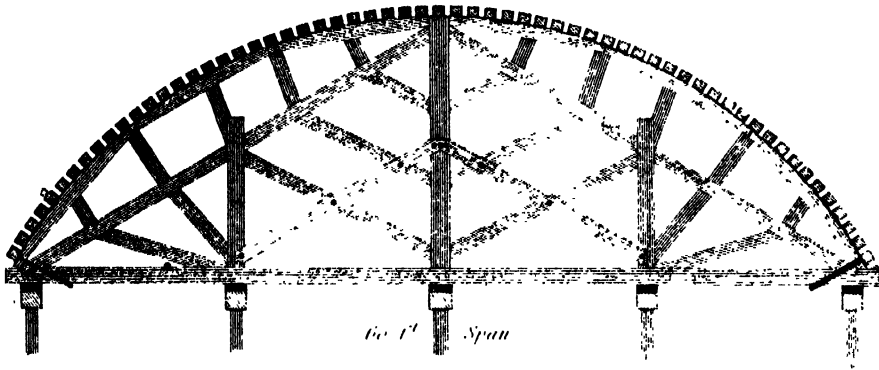




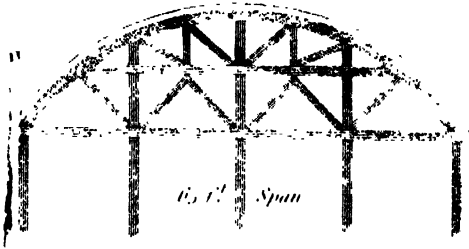
Proposed Funding Budget for the fifth.



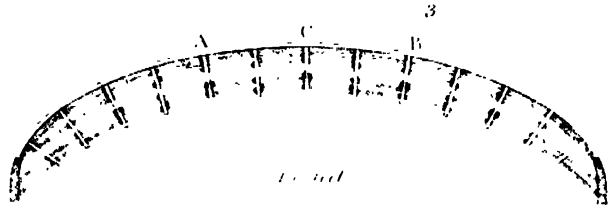
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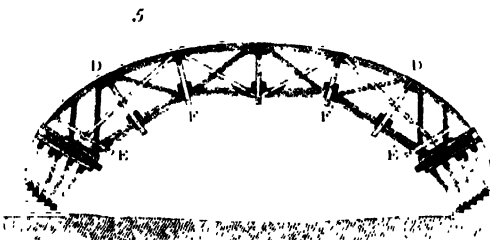
CENTRE OF GOLDSTREAM BRIDGE BY SMEATON.



CENTRE OF CONON BRIDGE BY TELFORD.



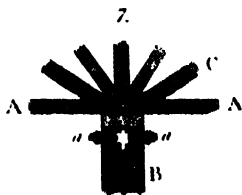
CENTRE OF THE BRIDGE OF NEUILLY BY PERRONET.



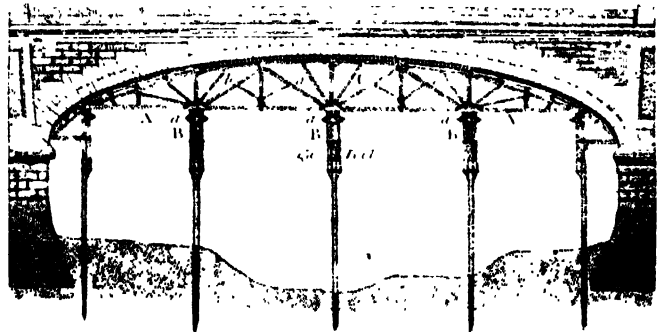
CENTRE BY TREADGOLD.



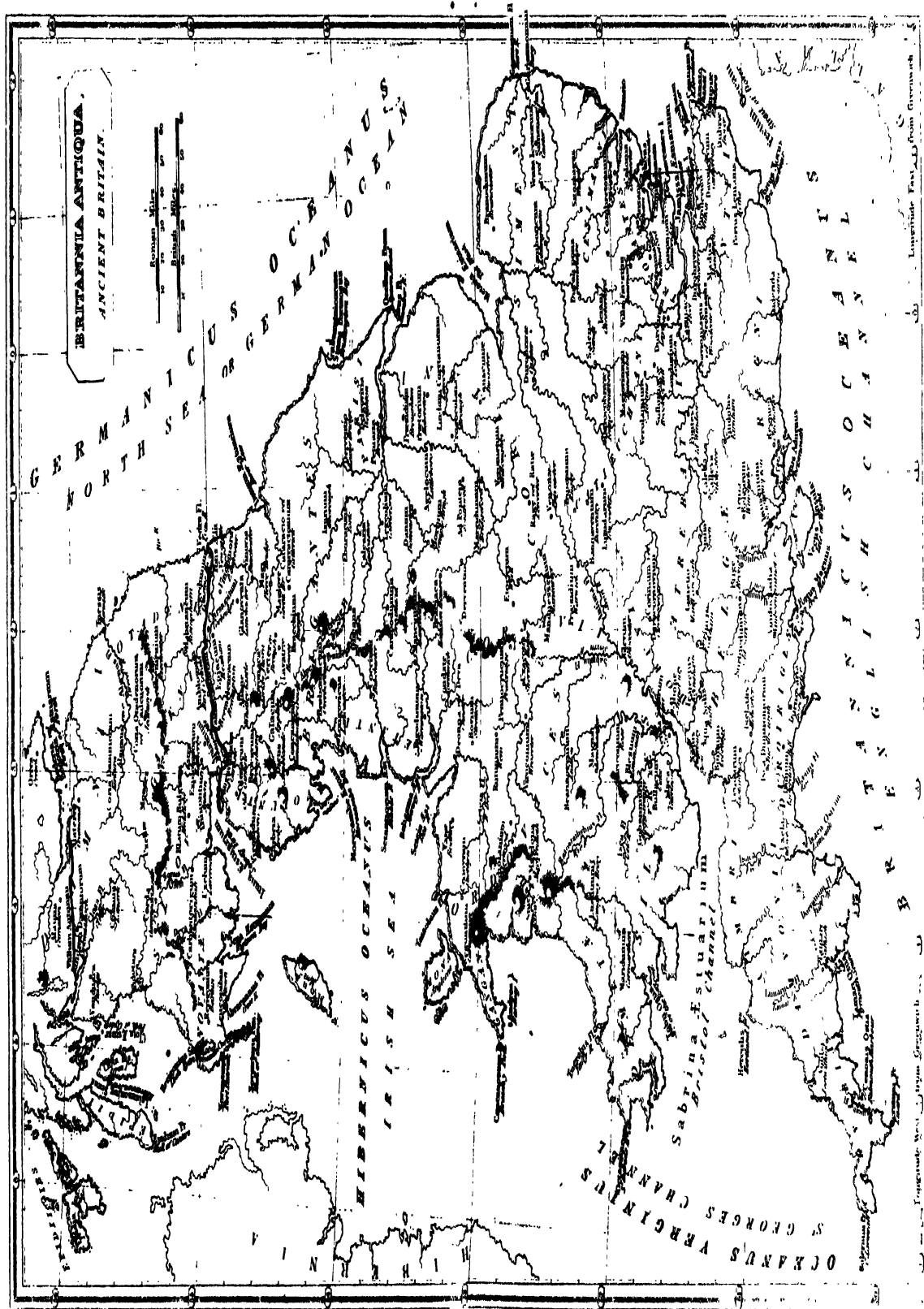
CENTRE OF WATERLOO BRIDGE BY RENN E.



SCREW WEDGES FOR LOWERING THE CENTRE ON A LARGE SCALE.



DESIGN FOR A CENTRE FOR THE LARGE ARCH OF LONDON BRIDGE BY ELMES.





Bradypus tridactylus Three-toed Sloth

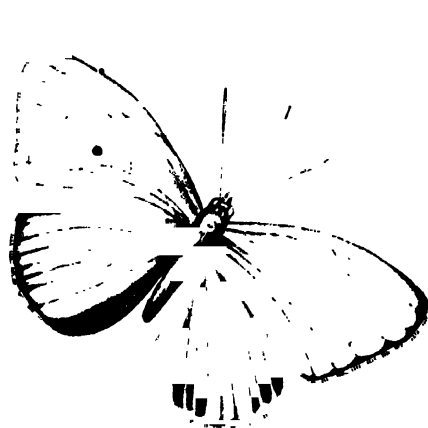


Myrmecophaga jubata Great Ant-eater

Tatusia paba Pebeta



Manis tetradactyla Long-tailed Manis



Cataglyphis excelsior *Heutsens*
Amazon Butterfly



under side



Ornithoptera Brookeana *Brookes* *Borneo Butterfly* *male*



Epicalia Pentha



Drusilla Mylæcha

Macgillivrayi *Lemoult.*



Heliconia hermanni



Agrias claudia

The Amazon Butterfly



Dionea carolina

The Carolina Butterfly

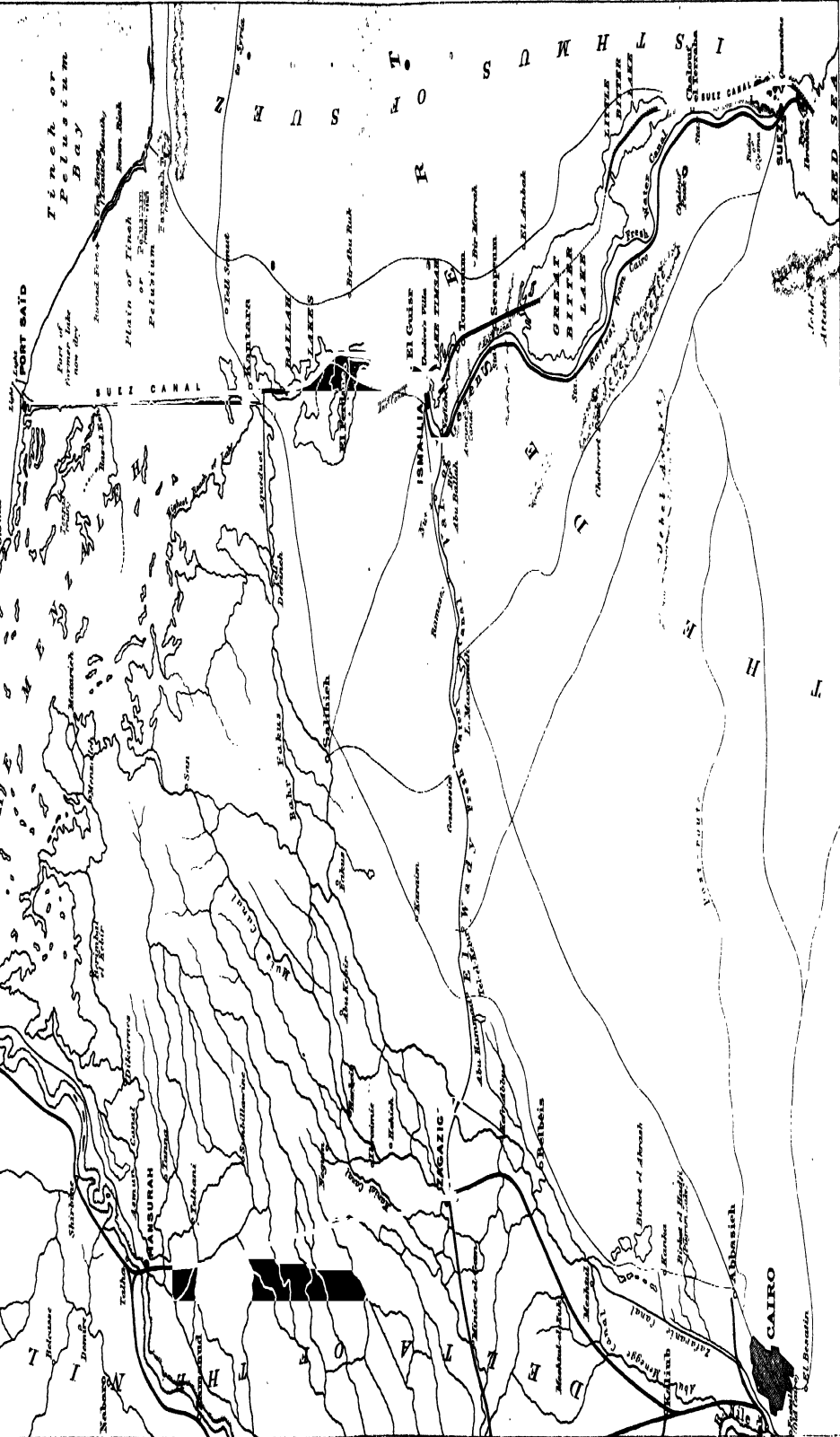


Heliconia hecates

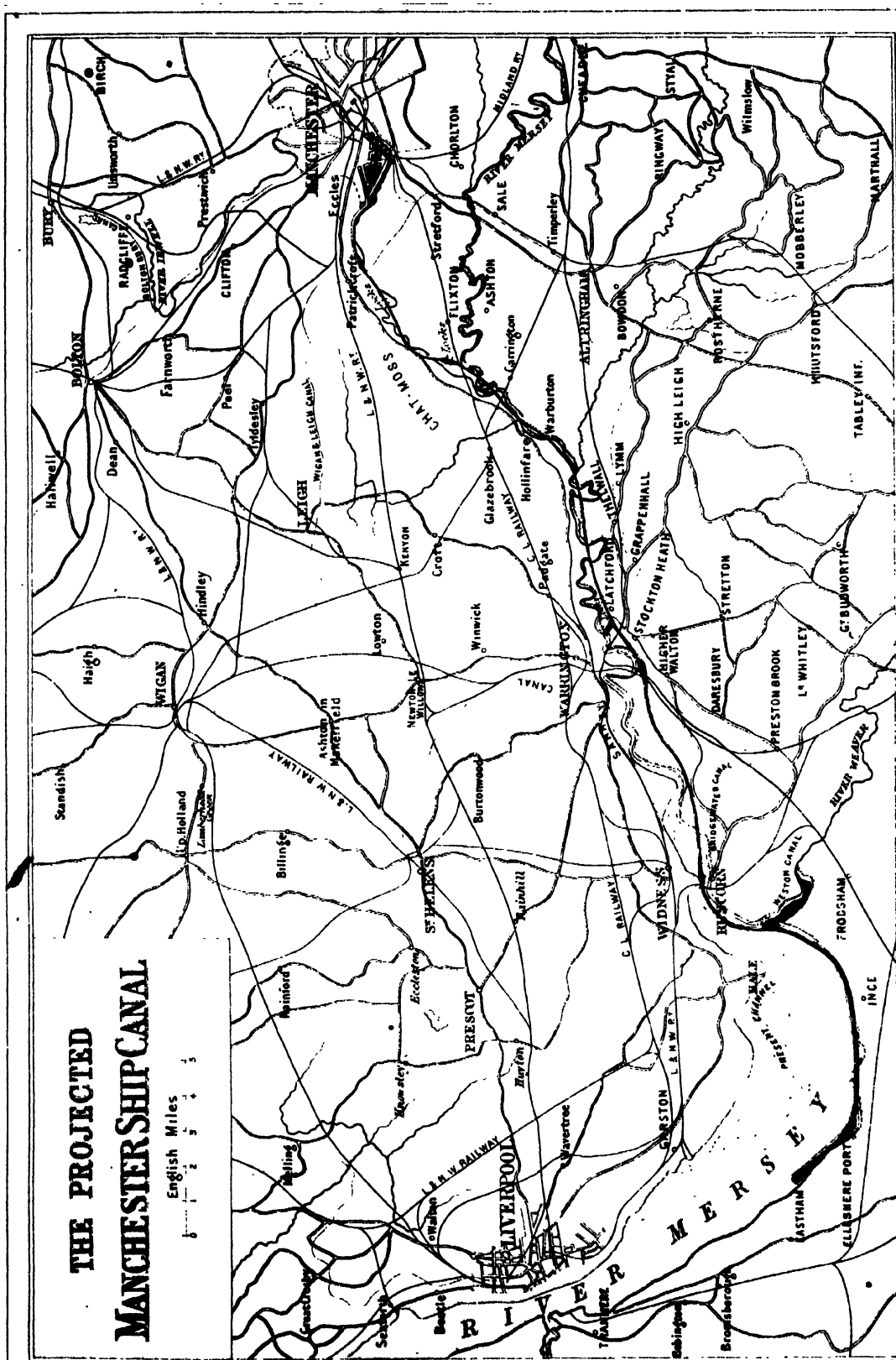


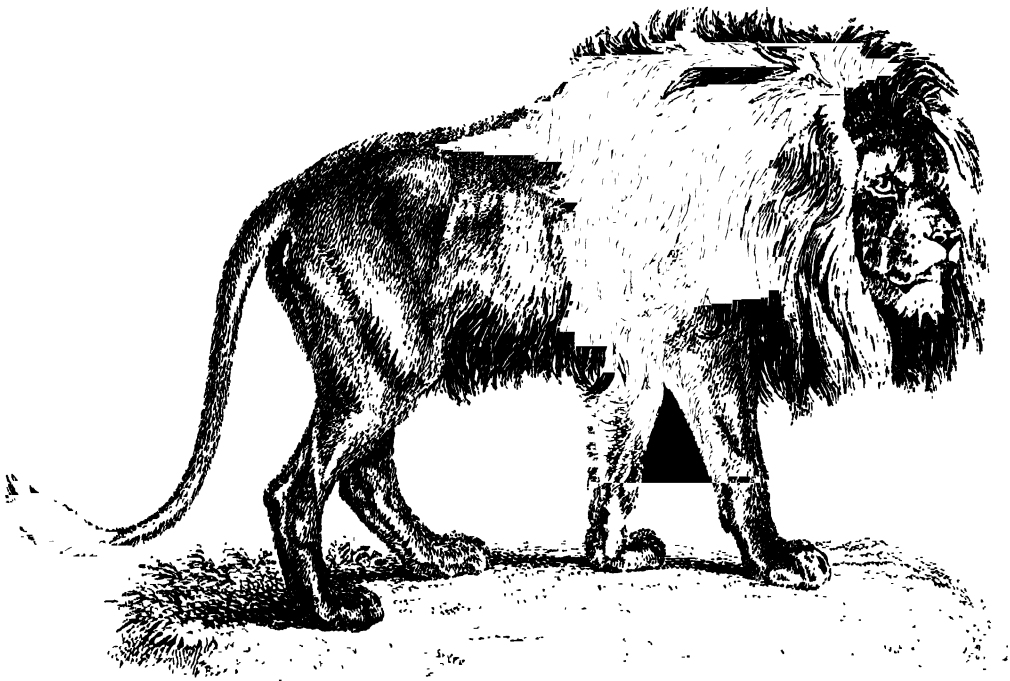
Celyna caryocata

SUEZ CANAL

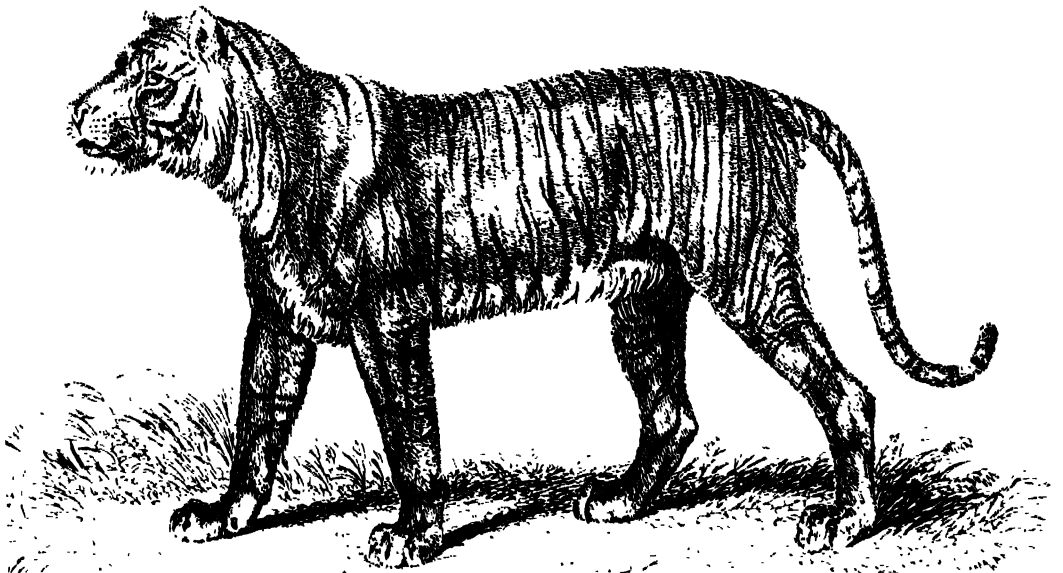


English Miles

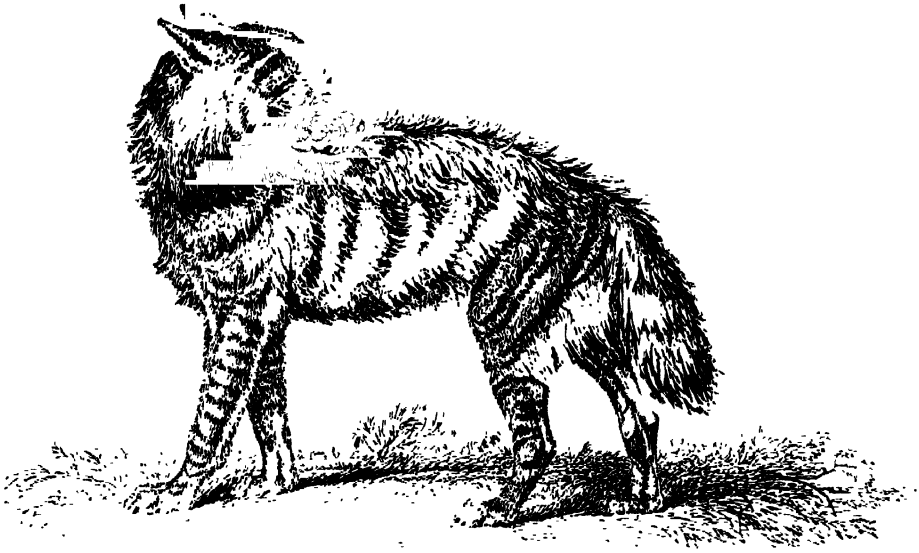




Felis leo Lion



Felis tigris Tiger



Hyaena striata — Striped Hyena



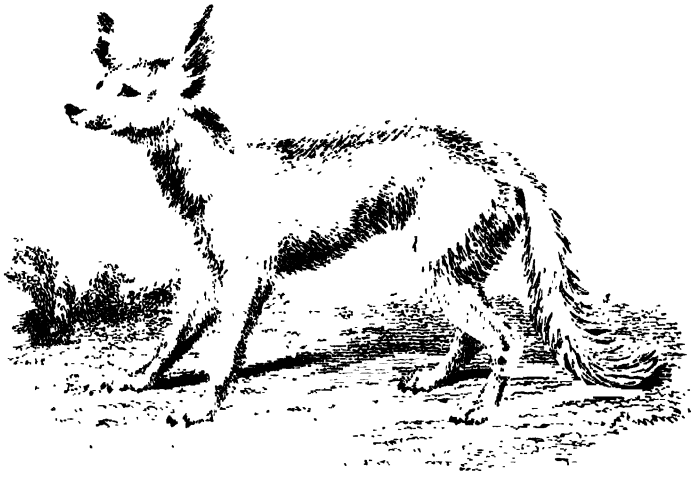
Viverra civetta — Civet



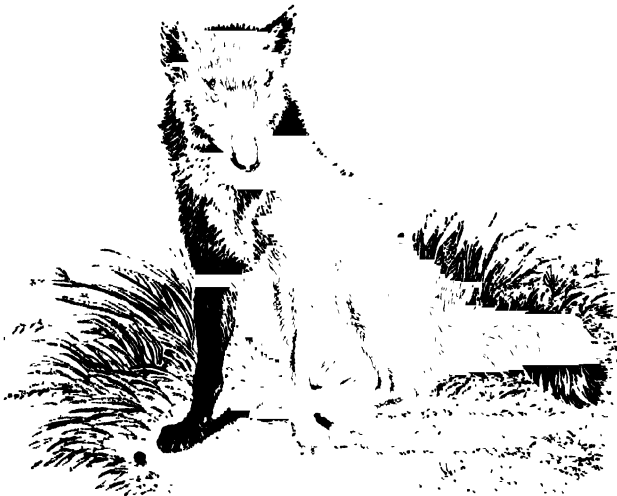
Herpestes ichneumon Egyptian — Ichneumon



Canis aureus Linné



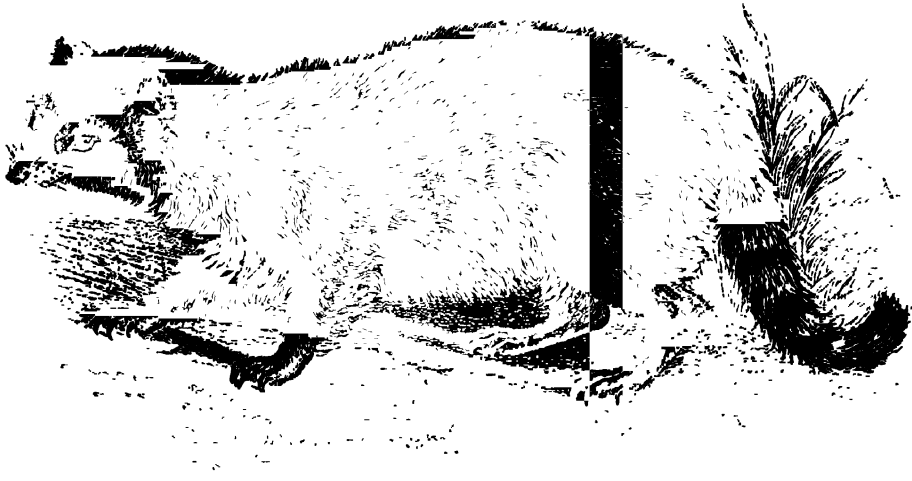
Megalotis zerda Temm.



Vulpes vulgaris Linné

CARNIVORA.

PLATE 4.



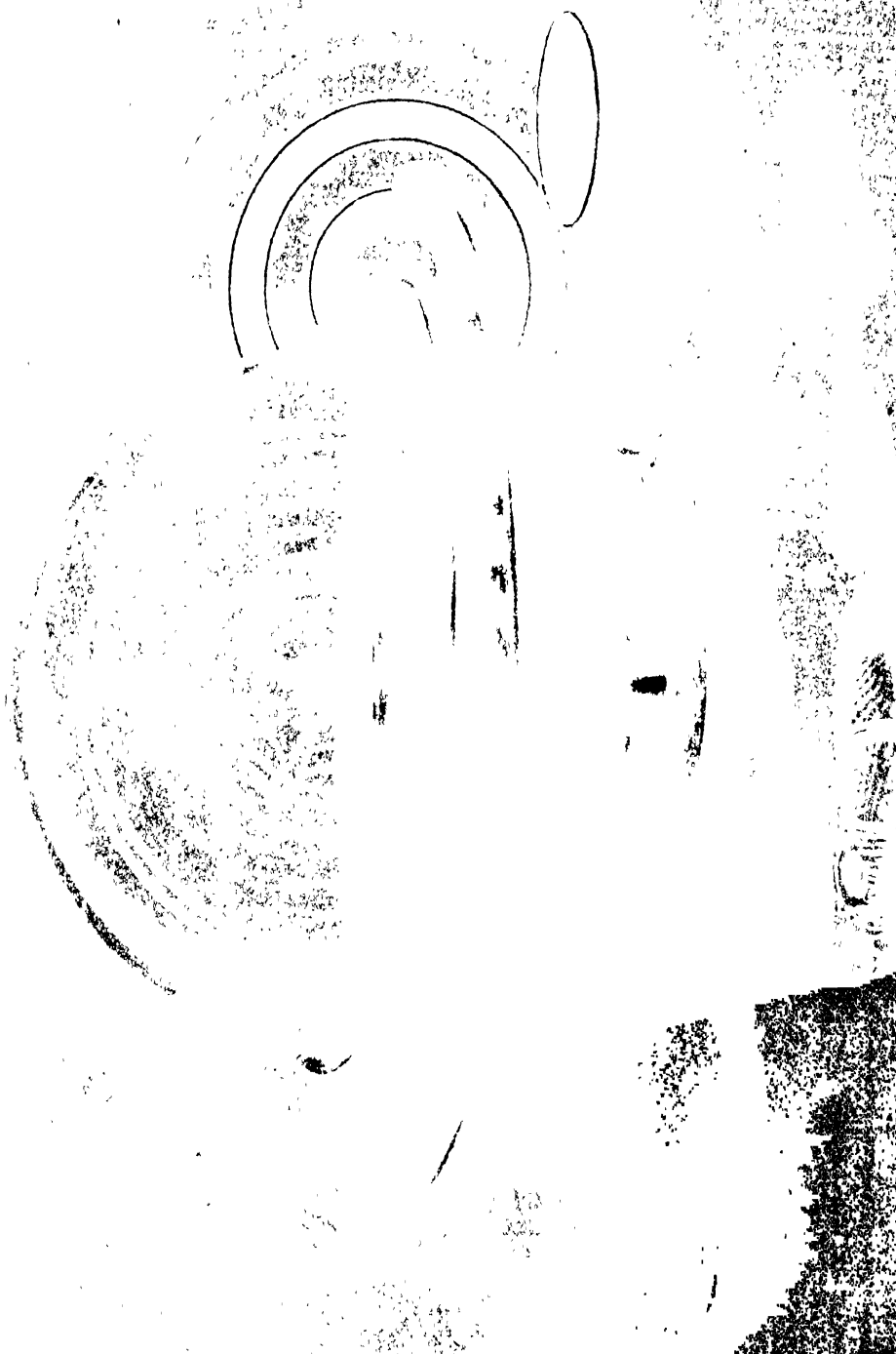
Procyon lotor Raccoon



Nasua narica. Coati Monkey



Mephitis mephitis. Skunk





Chinese - Blue

Chinese - Blue - Green - Red

Chinese - Red and Green

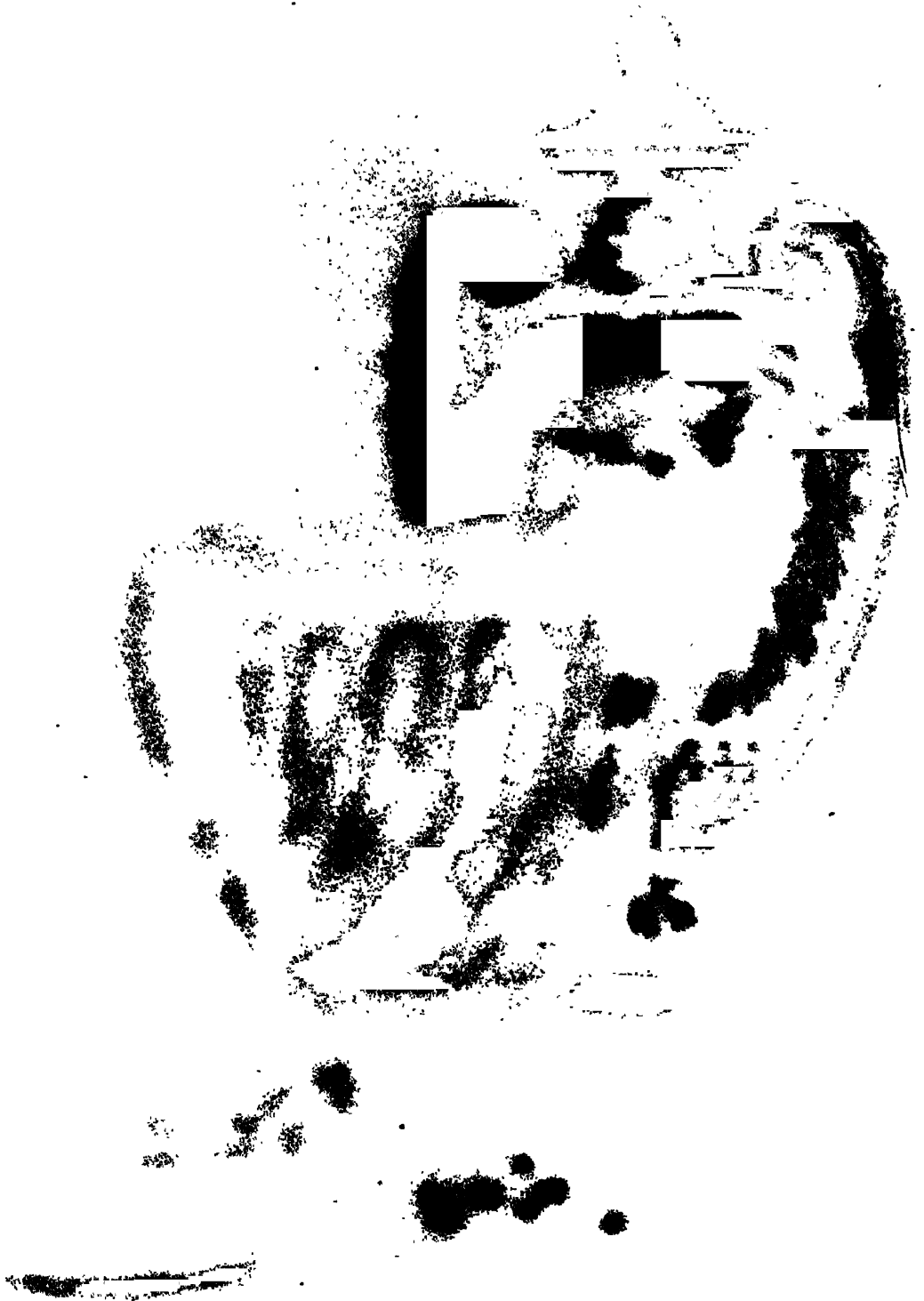
Japanese - Green - Blue - Red

Japanese - Green - Red





1. Italian. Mayolica vase (16th cent.)
2. French. Gris bleu vase (1750)
3. English. Jasper ware vase (18th cent.)
4. Old Herculaneum. Etruscan vase (5th cent. B.C.)
5. Italian. Porcelain vase (18th cent.)
6. Gris de Namur. Pottery (18th cent.)





Physeter macrocephalus Cuvier et Valenciennes.



Sphyrna tiburo (Shark)



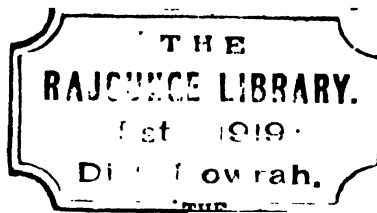
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BRAIN,	„ I.
BRAKE,	„ I.
BREAD,	„ I.
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No 2



First Class Subscribers.

NATIONAL ENCYCLOPÆDIA

A DICTIONARY OF

UNIVERSAL KNOWLEDGE.

BLEACHING.

BLEACHING is the process by which certain animal and vegetable products, especially such as are used in the manufacture of clothing, are rendered white. Wool and silk, cotton and flax, the substances most usually submitted to this process, contain certain colouring matters which, though natural, are not essential constituents; and these colouring matters are more readily acted upon by chemical agents, and suffer decomposition with greater facility than the animal and vegetable substances with which they are combined, so that they may be removed with little or no injury to the texture of the articles, thereby increasing their beauty, and fitting them for the processes of the dyer and calico printer.

Bleaching is a very ancient process, and was practised especially in Egypt, but probably in a very simple and tedious way; the process, perhaps, consisting of little more than exposure to air, light, and moisture. The art was scarcely known in Great Britain until about a century since, it having formerly been usual to send brown Scotch linen to Holland to be bleached, where it was done by steeping several days in a solution of pearl-ash, and subsequently for nearly a week in butter-milk, and then spreading it out upon grass for some months. One of the first improvements made on this tedious process was the introduction, about the middle of the last century, by Dr. Home, of Edinburgh, of dilute sulphuric acid in lieu of sour milk, by which the process, which formerly occupied from six to eight months, was reduced to four months, the acid being as effectual in one day's application as the milk in six or eight weeks. This improvement was eclipsed by the application of chlorine, which was discovered by Scheele about 1774. Berthollet, in a paper read before the Academy of Sciences at Paris in 1785, suggested its application to bleaching; and from him the process was shortly afterwards introduced into Scotland by Watt. About the same time Mr. Thomas Henry, of Manchester, introduced the process in Lancashire; and to these two gentlemen belongs the credit of perfecting and applying in this country a process whereby as much bleaching is as well performed in a few hours, within a space a few hundred yards square, as on the old process would have required weeks of exposure upon a hundred acres of land. This old process is still, however, used in Ireland in the bleaching of flax and linen. The chlorine was first used in a state of simple solution in water; but chloride of lime, commonly called *bleaching powder*, for the manufacture of which Mr. Tennant, of Glasgow, obtained a patent in 1799, is now almost universally employed, especially in the bleaching of cotton. The bleaching of fabrics by chlorine is now an important separate industry, and involves many consecutive operations and a number of details, to which careful attention is necessary to insure success.

VOL. III.

BLEAK.

It does not bleach at all in the dry gaseous state, and acts only in the presence of water; the colouring matter is oxidized and destroyed by the oxygen, probably set free as ozone, the chlorine combining with the hydrogen to form hydrochloric acid. Chloride of lime is the agent universally employed, containing as it does a large proportion of chlorine, more than a third of its weight, in a cheaply available, portable, and soluble form. A weak solution, about 2° Twad., is usually employed, the object being to destroy the colouring matter without injuring the fabric. The articles to be bleached are passed, after chlorination, into a weak bath of hydrochloric or sulphuric acid, and after being well washed are usually submitted to the action of a so-called antichlore, generally hyposulphite of soda, to remove any traces of chlorine, which, if allowed to remain, would destroy the material. Sulphureous acid gas, another long-known bleaching agent, or the fume of burning sulphur, is employed in bleaching wool and silk, as well as straw and feathers, all these substances being injured by the action of chlorine. Straw is generally bleached by oxalic acid; wax is usually bleached simply by exposure to air, light, and moisture; oils by long exposure to light. Some processes of decoloration are effected by means of animal charcoal; these are mostly dark syrups obtained in the refining of sugar. Other processes of bleaching, depending on the action of ozone, have been suggested, such as the use of peroxide of hydrogen and permanganate of potash. It has been also proposed, in bleaching by chlorination, to develop the chlorine gradually by passing the cotton fabric over rollers electrically charged. This is intended for discharging printed colours in calico printing.

BLEACHING POWDER (chloride of lime) is made by exposing slaked lime to the action of chlorine, and owes its bleaching properties to the presence of calcium hypochlorite (CaCl_2O_2). See **CHLORINE**.

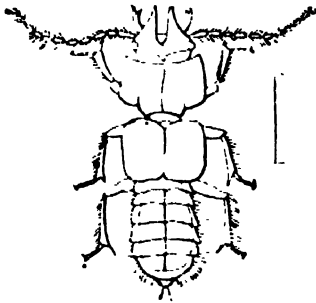
BLEAK (*Alburnus lucidus*) is a fish belonging to the same family as the **CARP** and the **BREAM**, in the order **PHYSOSTOMI**. The bleak is about 7 inches in length, having an elongated body covered with scales of moderate size. The anal fin is long, and has more than thirteen spines; the dorsal is short, without a spine, and is situated opposite to the space between the ventrals and the anal. The lower jaw projects beyond the upper.

The bleak is very beautifully marked, his back, according to Isaac Walton, being "of a pleasant sad sea-water green; his belly white and shining like the mountain snow." This beautiful appearance is due to a silvery pigment which is formed on the inner surface of the scales. This peculiarity is also found in the whitebait, roach, dace, and similar fishes. The scales are used for making artificial pearls, and the pigment is called in Paris *essence de l'orient*. According to Yarrell, the method of obtaining

and using the pigment was, first, thoroughly to clean the scales by exposing them to a current of water, and then to soak them for a time, after which the colouring matter was deposited. When thus procured, small glass tubes are dipped in the pigment and injected into hollow glass beads of various forms and sizes. These are then spread upon sieves, and dried in a current of air. If greater weight and firmness be required, more wax is injected. The bleak is an inhabitant of most of our British rivers.

BLECH'NUM is a genus of FERNS, in which the fronds are simple, pinnate or pinnatifid, growing in clusters from the end of the caudex. The sori form a line on each side of the midrib, and parallel with it, and are covered with indusia, which are attached by the side next the margin of the leaf. There is but one British species of this genus, the *Blechnum boreale* (hard fern). It occurs in every European list of plants, and has been found in Madeira and neighbouring islands, and near the Caucasus.

BLE'DIUS, a genus of BEETLES of the section PENTAMERA and family STAPHYLINIDÆ. They have the following generic characters:—the antennæ with the basil joint very long, the remaining joints bent at an angle with the



Male of a cornuted Blediid Beetle.

first, the maxillary palpi with the second and third joints large, the terminal one slender, the mandibles armed with a tooth internally towards the apex, the body elongate and cylindrical, the head furnished with two tubercles or spines, the thorax armed with a horn in the males, the legs short, the four anterior tibiae broad and flat, having numerous spines on the external part. The Bledii appear to be peculiar to the sea-coast, where they burrow in the wet clay or sand.

BLEED'ING, the operation by which blood is removed from the body, with a view to the prevention and cure of disease. Bleeding is either general or local. General bleeding is practised when the object is to lessen the whole mass of circulating blood; local, when the object is to lessen the quantity in some particular part of the body. General bleeding consists either in opening a vein (venesection), or in opening an artery (arteriotomy). When an artery, the anterior branch of the temporal artery is generally selected. A transverse cut is made half-way through the vessel, and when sufficient blood has been drawn it is cut completely across, and closed with a pad and a bandage. In venesection the blood is generally drawn from the arm, the veins in the bend of the elbow being generally chosen. The patient is placed in a chair, or, if confined to bed, in a sitting posture, and the arm having been bared, a bandage is placed about 2 inches above the elbow. This causes the veins to swell up, and the surgeon, selecting one, makes a small oblique slit with a sharp lancet, and allows as much blood to flow as may be required. The bandage is then removed from above the elbow, and the cut closed by means of a pad of lint, with an appropriate bandage. The practice was in former times exceedingly common, being adopted in all inflammatory diseases, and often when there was no disease at all. Many persons in good health were regularly bled in the spring and the autumn as a precaution against disease! With improved knowledge of medicine and surgery this mischievous practice has fallen into disuse, and general bleeding is seldom resorted to, even in cases of disease. Local bleeding, for the relief of local

congestions, is more useful, and it is performed by a variety of means, such as cupping, leeches, and by simple incisions with the lancet.

The bleeding which accompanies accidental cuts and wounds is often a very serious matter, and one that requires skilled and prompt attention. The most dangerous form of accidental bleeding is that which arises when an artery is wounded and the blood escapes in jets of a bright red colour. Where such a wound is at all severe, recourse should be had to the nearest medical advice, and prompt means should be taken to stay the flow of blood till this can be obtained. This is most readily done by compressing the artery between the wound and the heart. In the arm the artery runs along the inner side of the limb, where it may easily be felt beating. In the thighs the main artery runs down the middle of the front of the limb. The readiest mode of compression is that of the thumb or finger, and this may be applied while a temporary tourniquet is prepared. A piece of strong tape, a handkerchief, or even a piece of strong cord, may be used for this purpose. A wine cork, a stone, or a coin, should be placed over the artery between the wound and the body, and tied tightly with the bandage, increased pressure being given by means of a stick, which should be tied in the knot and twisted round and round. In the case of a wounded vein, which may be distinguished by the steady flow of dark-coloured blood, a similar bandage should be applied below the wound, or a piece of lint or soft linen may be placed over the wound and firmly bound down with a bandage. When a varicose vein bursts the sufferer should lie down at once, and the leg should be raised and pressure applied upon the bleeding point. A pad of lint should be then placed upon it and secured with a firm bandage, the limb being kept at rest until the wound heals.

BLENDE (Ger. *blenden*, to dazzle), the name given to an ore of zinc found in primitive and secondary rocks in many parts of the world. Consisting of about two-thirds of zinc to one of sulphur, it is often called *sulphuret of zinc*. By English miners it is called *Black Jack*, from its dark colour. It is principally found in England in the mines of Derbyshire, Cumberland, and Cornwall, being generally associated with galena, or lead glance.

The term blende is also occasionally applied to the sulphides of other metals, as manganese blende, antimony blende, &c.

BLEN'HEIM or **BLINDHEIM** (Ger. "Home of the Blind"), a small village of Bavaria, circle of the Upper Danube, on the Danube near Höchstädt. This village is famous in history as being the scene of the great battle fought 13th August, 1701, between the English and Imperialists, under the Duke of Marlborough and Prince Eugene, and the French and Bavarians, under Marshals Tallard and Marsin and the Elector of Bavaria. Each army consisted of nearly 80,000 men. The English and their allies gained a complete and decisive victory. Their enemies left above 10,000 men killed and wounded on the field, a vast number more were drowned in the Danube, and above 13,000 were made prisoners; among the latter were Marshal Tallard (whose son was killed) and many other officers of distinction. All the artillery, baggage, &c., of the French and Bavarians fell into the hands of the conquerors. The loss of the latter, though severe, was not greater than might have been expected, having amounted to about 5000 killed and 8000 wounded.

BLEN'HEIM HOUSE, at Woodstock, near Oxford, 60 miles W.N.W. of London, is an edifice erected in the reign of Anne as a token of national gratitude for the public services rendered by the first Duke of Marlborough, for which purpose £500,000 was voted by Parliament; and the queen added the honour of Woodstock (an ancient property of the crown) to the grant. It was designed by Sir J. Vanbrugh, and called Blenheim from the great battle

noticed above. Attached to the house is a very fine demesne of 2700 acres. The usual entrance to this splendid domain is from the Woodstock side, under a triumphal archway of the Corinthian order, erected by the first duchess. Fronting the palace is a fine sheet of water, partaking of the character both of a lake and river, and winding away through a deep vale; this is spanned by a magnificent bridge, and on an eminence beyond the bridge, in the midst of a fine lawn, is a fluted Corinthian pillar, 130 feet high, surmounted by a statue of the duke in a Roman dress. The mansion occupies three sides of a parallel-gram, the principal front being north, and the east and west sides forming wings for the domestic offices, stables, &c. A terrace with several flights of steps gives due effect to the elevations. The north or principal front extends 348 feet from wing to wing, and the great hall is a lofty and noble apartment in good proportions. The interior of the house is magnificently finished, and contains a fine collection of sculptures, paintings, and tapestry.

BLENNY is the name of a family of fishes belonging to the order ACANTHOPTERYGII. In a large proportion of the members of the family the skin is scaleless, and even when scales exist, much mucus is poured out by glands, a character which is expressed by the name of the typical genus *Blennius* (Gr. *blennos*, mucus). The distinguishing feature of the family is the position of the ventral fins, which are *jugal*, that is, placed before the pectorals. The ventral fins are composed of a few rays. In some of the genera they are rudimentary, in some cases having no function at all, in others being used by the fish for moving rapidly over the bottom of the sea. In a few cases these fins are totally absent. In form the blennies are elongated and more or less compressed, with one dorsal fin, composed almost entirely of simple, jointless, but flexible rays. In some aberrant forms the dorsal is divided into lobes, or even separate parts. The caudal is distinct, or united to the other vertical fins. The males have most generally a cluster of anal papillæ. The oviduct opens externally between the vent and the orifice of the urinary canal. The stomach is thin, without a cæcal dilatation, and there is no air bladder. There are generally present *pseudobranchiæ*, which are "remains of an anterior gill which had respiratory functions during embryonic life."

The genera are very numerous, occurring in abundance in all temperate and tropical seas. The following are the principal genera:—*Blennius*, *Anarrhæus*, *Centronotus*, *Zoarces*, *Salarias*, and *Pataecus*. In the genus *Blennius* the head is short and rounded, the teeth are long and slender, and placed in a single row; the body is long, compressed, smooth, and possessing only one dorsal fin, which extends nearly the whole length of the back. The species of this genus are small, live in shoals, but not in great numbers; they are very active and tenacious of life, and frequent rocky coasts, where they may often be found in the pools of water left by the tide, hiding themselves among the weeds and in the crevices of the rocks. In the British seas the following species have been discovered:—*Montagu's Blenny* (*Blennius Montagu*), the **BUTTERFLY-FISH** (*Blennius ocellaris*), the Gattoruginous Blenny (*Blennius Gattorugine*), the **SHANNY** (*Blennius pholis*), and Yarell's Blenny (*Blennius Yarellii*).

The best known species of the genus *ANARRHÆUS* is the gigantic Wolf-fish (*Anarrhæus lupus*), which is an inhabitant of the northern seas. In the genus *Centronotus*, the **BUTTER-FISH** (*Centronotus gunellus*) is common on British coasts. The genus *Zoarces* is remarkable in that a species (*Zoarces viviparus*) produces its young alive. The species of the genus *Salarias* are all tropical. In certain adults of both sexes of some of the species a crest of skin is developed along the back. The genus *Pataecus* is exclusively Australian. The body is oblong, with a short snout, and the ventral fins are altogether

absent. The families most nearly allied to the blennies are Cepolidae (BAND-FISHES), Trichonotidae, Heterolepidotidae, and Acantholinidae. *Cepola rubescens* is figured in the Plate, as is also the Butterfly-fish and Wolf-fish.

BLÉRÉ, a town of France in the department of Indre-et-Loire, on the Cher, 17 miles E.S.E. of Tours, near the railway from Tours to Bourges. The population in 1883 was 3700. The Castle of Chenonceaux, once the property and residence of the celebrated Diana of Poitiers, is situated in the immediate vicinity of Bléré. Diana, having been dispossessed of the castle by her rival, Catherine de' Medici, the latter surrounded it with a superb park. After many vicissitudes it was acquired in 1733 by M. Dupin, a gentleman distinguished by his wealth and learning, but more by the wit and beauty of his wife. Under its new master Chenonceaux became the resort of some of the most illustrious personages of the eighteenth century, including among others Voltaire, Montesquieu, Buffon, Fontenelle, and Bolingbroke. Rousseau wrote several pieces for the theatre of Chenonceaux, and it was here that the "Devin de Village" first appeared.

BLESS' BOK (*Antelope albifrons*) is a South African ANTELOPE, inhabiting the plains bordering on the Vaal River, and herding in immense flocks. A full-grown buck stands $3\frac{1}{2}$ feet in height, and carries a pair of diverging horns, ringed at the base, measuring from 12 to 15 inches in length. The hair has a deep chocolate colour in front, passing into a heavy bluish-white on the back and shoulders, the belly being quite white. The tail is long, reaching to the hocks. The female is similar, but of lighter build.

BLESSINGTON, MARGARET, COUNTESS OF, was born at Knockwilt, near Clonmel, in the county of Tipperary, Ireland. She was the second daughter of Edmund Power of that place, a gentleman of ancient family, originally settled in Waterford. At the age of fifteen she was married to Captain Farmer, and after his death she became, in 1818, the wife of Charles John Gardiner, earl of Blessington. In company with her husband she spent the intervals between 1823 and 1829 in an extensive tour through the continent of Europe, in the course of which she studied largely, and enjoyed the society of the most distinguished men of the time. The result of her observations were given in two works subsequently published, entitled "The Idler in Italy" and "The Idler in France." In 1829 the earl died, and Lady Blessington took up her residence in London, first at Leamont Place, Mayfair, and afterwards at Gore House, Kensington. At both places she succeeded in gathering round her, at her attractive and brilliant soirées, some of the most illustrious of her contemporaries.

The expense in which this mode of life involved her was beyond her means, and she retired to Paris in 1849, but she was seized with a fit and died suddenly the day after her arrival. In addition to the works mentioned, she was the authoress of numerous novels and many contributions to contemporary literature, both in prose and verse. Perhaps the only one likely to have any permanent value is the "Journal of Conversations with Lord Byron," which was published in the *New Monthly Magazine* in 1832, and again in a collected form in 1834.

BLETCH'INGLEY, a village of Surrey, 24 miles S. from London, being 3 miles distant from the Redhill station on the South-eastern Railway, was formerly a parliamentary borough, but was disfranchised by the Reform Act of 1832. Lord Palmerston was its last member. It is said to have possessed at one time seven churches, and had a feudal castle, which in 1263 was destroyed by Henry III.'s army. It was afterwards rebuilt, and inhabited by Queen Anne of Cleves. No ruins of it are extant, but its foundations may be traced. The parish church is chiefly Perpendicular in style, but has Norman portions. There is an endowed school for twenty boys,

and eleven almshouses founded in 1668. The inhabitants are chiefly engaged in agriculture, and in the neighbourhood large quantities of fuller's earth are raised. There are also some quarries and brick-fields. The views from the high ground in this neighbourhood are of great extent and variety.

BLETTING. All ripe fruits, after they have been kept for some time, begin to decompose, and the spots formed on the fruit during this process are called *blets*. With this partial decomposition, there is going on at the same time a formation of sugar. This process is sometimes produced artificially, e.g. with medlars, in order to render them fit for eating.

BLI'DAH, a town in Algeria, about 30 miles by railway from the city of Algiers. It is beautifully situated at the foot of the Atlas, and on the borders of the fine plain of Métidja. It is the centre of commercial relations for the principal towns of the province, and has a thriving aspect. The population in 1883 was 9000.

BLIGH, WILLIAM. See BOUNTY, MUTINY OF THE. **BLIGHIA**, a genus of plants named after Captain William Bligh, R.N., belonging to the order SAPINDACEÆ. Only one species of this genus has been described, the *Blighia sapida* (Akee-tree). It is a native of Guinea, whence it has been introduced into the West Indies and South America. The ail of the seed is pulpy and of a grateful subacid flavour, and is eaten in Africa and the West Indies.

BLIGHT, a popular name for any kind of pestilence which affects cultivated plants by curling up or destroying their leaves and blossoms, or by giving them a yellow sickly appearance, or by covering certain parts of them with unnatural colours. Properly speaking, it is limited to those diseases in wheat and other grains which are caused by minute parasitic fungi, and which are called also *bunt*, *pepp*, *beard*, *smut*, *falls*, or *stinking rust*. A false kind of blight is that which is caused by an excessive development of the epidermal cells, which push their way through the cuticle and form specky or mottled patches, which, from their peculiar appearance or colour, attract notice, and give the plant the appearance of the true blight. It is as a rule, however, harmless to the plant.

BLIMBING or BILIMBA TREE. See AVERRHUA. **BLIND, THE.** To the popular mind the affliction of blindness seems to be, next to the loss of reason, the greatest of misfortune. We live and move in a world of light, a condition to which the eye is wonderfully adapted. The destruction of this organ shuts out all that is beautiful and sublime in nature, all that is dear and expressive in the human countenance. Facility of moving about is interrupted, full recourse to books and libraries is denied, the ordinary pursuits of business are closed, and the blind are often subjected to a life of dependence and poverty. While all these privations must be admitted, yet the blind, especially the educated, are not an unhappy people. On the contrary, they are cheerful, and with genial occupations and a comfortable support, are contented and even happy. Though "it is a pleasant thing for the eye to behold the sun," and we do not strictly associate darkness with gloom, yet this is not the effect upon the born-blind, or those who have been long in that condition. But this happy relief is found only or chiefly in that beautiful law of compensation which a merciful Providence has connected with this affliction, trained and developed by special systems of education. By this law the lost sight gives increased power and sensibility to the remaining senses. Touch and hearing perform a large share of the work of conveying to the mind a knowledge of external things. The blind child feels and discovers the shapes of all objects, their qualities of smoothness, roughness, and consistency, and soon associates with them the names which curiosity prompts it to inquire after. Such a child may be taught a thousand things

through its touch and hearing; and its tenacious memory, constantly exercised, rarely parts with them. The blind find a happy compensation in their love of music, which is generally largely cultivated by them. But the highest and most satisfactory compensation the blind receive is that derived from the training and instruction in religion, literature, and the mechanical arts pursued in the institutions founded for their benefit.

In a very interesting work ("Blindness and the Blind; or a Treatise on the Science of Typhology," by W. Hanks Levy, F.R.G.S., London, 1872) written by a gentleman blind from his infancy, we learn something of the wonderful sensitiveness to which the author had attained; and the same is doubtless the case with many who are afflicted with total blindness. "I can tell," he says, "when opposite an object, whether it be tall or short, slender or bulky. I can also detect whether it be a solitary object or a continuous fence, whether it be a close fence or composed of open rails, and often whether it be a wooden fence, a brick or stone wall, or a quick-set hedge. When passing along a street I can distinguish shops from private houses, and even point out the doors and windows, &c., and this whether the doors be shut or open. While walking with a friend in Forest Lane, Stratford, I said, pointing to a fence which separated the road from a field, 'Those rails are not quite so high as my shoulder.' He looked at them, and said they were higher. We, however, measured, and found them about 3 inches lower than my shoulder. When the lower part of a fence is brickwork and the upper part rails, the fact can be ascertained, and the line where the two meet easily detected." Mr. Levy ascribes this singular quality to an unrecognized sense which he terms "facial perception," he having proved that the power arose from neither of the five senses. He was in each case a certain distance from the objects he described, and his perception of them was the same even if his ears were stopped. He appeared to perceive objects through the skin of his face, and to have the impressions immediately transmitted to the brain; and covering the face with a veil destroyed the sensitiveness entirely.

Mr. Levy reminds us that while blind children may follow most of the sports of childhood, blind men and women are not debarred from a number of pursuits for which eyesight might be deemed indispensable. Thus we read of the brave John, king of Bohemia, who died fighting valiantly, and whose motto, "Ich Dien," is now worn by the Prince of Wales; of Ziska, the one-eyed, who lost his remaining eye in battle, but fought and conquered for Bohemia notwithstanding; of the blind philologist Scapinelli, one of the most accomplished scholars of his day; of Count de Pagan, who, on becoming blind, devoted himself to the study of fortification and of geometry; of Dr. Nicholas Sanderson, who, although blind almost from his birth, lectured upon optics, and was professor of mathematics in the University of Cambridge; of Sir John Fielding, half-brother of the great novelist, and chief magistrate of Bow Street Police Court, whose acuteness on the magisterial bench may have been equalled, but has never been surpassed; of Huber, the eminent naturalist, who invented the glass bee-hives now in common use; and of James Holman, who travelled without an attendant through a large portion of Europe, penetrated 5000 miles into the Russian dominions, performed a voyage round the world, and actually on one occasion saved the ship by taking the helm. Of one John Metcalf it is related that as a boy he went bird-nesting with his schoolmates; as a young man he followed the hounds, learned to swim and dive, and had the reputation of being a good boxer; was a good musician, dealt in woollen goods and also in horses, established public conveyances, became a builder and contractor, built bridges, laid down roads, made drains, and accomplished some difficult engineering works, which people who

had their sight declined. It is, in fact, difficult to imagine what more he could have done had he been able to see instead of being totally blind. More recently, the case of the Right Hon. Henry Fawcett, professor of political economy at Cambridge, and afterwards postmaster-general, will be familiar. Blindness in his case would not appear to be accompanied with any special disadvantage, for few men can enter with more zest into most of the usual recreations of those who can see; while, by his writings and eminent political services, he earned the gratitude of millions of our fellow-subjects in India, and won his way to a distinguished position in the government. Perhaps a still more extraordinary case is that of Sir George A. Macfarren, principal of the Royal Academy of Music, and also filling the chair of music at the University of Cambridge. By the use of readers and amanuenses he produced great musical works of every kind, and important theoretical treatises; and remained one of the strictest examiners and teachers, whom no blunder escaped, as well after the loss of his sight as before.

Causes of Blindness.—Blindness is congenital in many cases; but it results in a much greater degree from disease, accident, and old age. Among the principal inducing diseases may be named amaurosis or paralysis of the optic nerve, cataract, purulent ophthalmia, scarlet fever, scrofula, small-pox, and measles. Some business avocations have an important effect upon the eyes, and on the testimony of an eminent surgeon very prolific causes of blindness are small print and gas-light. Cheap newspapers and periodicals badly printed on bad paper, and bearing, as it were, a mouldy appearance, abound throughout the empire, and the amount of labour performed under artificial light is of course far greater than of old. The incorporation of sulphur with the gas, so as to increase at small cost its illuminating power, is also very injurious to the eyesight; and though the practice is unlawful, the fines inflicted are insufficient to repress it.

Hereditary blindness (that is, strictly derived from blind parents) is not frequent; although, from the last general report of the census of Great Britain, it may be inferred that, in these islands at least, blindness, like deaf-dumbness, has a tendency to develop itself in families. Blindness, in common with idiocy, insanity, deafness, and other mental and physical evils, also results often from intermarriage of first cousins, of uncles and nieces, and other relatives. All our public institutions contain such persons, and all medical experience abundantly demonstrates this important fact.

Census of the Blind.—It is everywhere acknowledged that an important service has been rendered by statistics to the blind and to the deaf and dumb. Not only have the authentic numbers of these unfortunate members of the community been ascertained, and found to be much larger than was previously supposed, but a fresh impulse has been given to the efforts of philanthropy on their behalf.

During the last thirty years the blind have been enumerated in the principal European countries and in the United States of America; in Great Britain and Ireland an inquiry into their numbers was, for the first time, instituted in 1851. The same form was repeated in 1861, 1871, and 1881.

The number of blind in England and Wales in 1881 was 22,832 (one in every 1138 of the population), of whom 12,048 were males and 10,784 females. The return showed an increase of 1242 over that for 1871, but the proportion of blind to the total population decreased from one in 979 to one in 1138.

In Scotland the number was 3158, and in Ireland 6111. These returns furnish a proportion of one in 1182 inhabitants for Scotland, and one in 847 for Ireland. For the United Kingdom, with the Channel Islands and Isle of Man, the blind may be set down at 32,101, being in the proportion of one in 1100 of the population.

As regards the distribution of the blind in England, the last returns were in every respect confirmatory of the conclusions derived from the previous enumerations, namely, that blindness is more common in agricultural than in manufacturing and mining districts.

Several obvious circumstances influence the distribution of the blind. The tide of emigration from the agricultural counties leaves behind in their native parishes persons labouring under such an infirmity as blindness. On the other hand, the towns and the manufacturing and mining districts are thickly peopled with immigrants, who labour under no physical disability. Again, loss of sight being one of the infirmities of old age, part of the excess of blind persons in the rural districts must be ascribed to the fact that those districts contain a larger proportionate number of persons in advanced life than the towns, where also large numbers of young persons are employed in factories or in trade as apprentices and workpeople, or in domestic service.

Amongst the blind of England and Wales there is a much larger number of males than females, the proportion being 111 to 100. This excess of blind males might be supposed to be mainly due to the fact that the occupations followed by men are more likely than those of women to produce accidents and diseases causing loss of sight; but in Scotland and Ireland the returns show an opposite result, the female blind being in both countries more numerous than the males. In Scotland the inequality of the sexes amongst the blind is not great, the proportion being 102 females to 100 males; in Ireland there is a larger excess of females, the proportion being 110 females to 100 males. The explanation of these disparities must be sought for in circumstances connected with the relative numbers of the sexes living at advanced ages in each division of the country, the effects of migration and emigration, and other local conditions.

Of blind children under five years of age, there are 567 in England and Wales, a slight increase on the previous return, but affording evidence of the fact that cases of blindness at birth are not of frequent occurrence. Between the ages of five and twenty there were 2452 blind of both sexes, namely 1376 boys and 1076 girls, and the e are mostly within the limits of age assigned for admission to the special institutions for this class. At the ages between twenty and sixty there are 8962 persons, or 12 per cent. of the whole number; while at the advanced ages of sixty and upwards there are 9609, or 15 per cent., whose blindness must in many instances be a natural infirmity connected with old age.

The period of life at which loss of sight occurs exercises an important influence on the future career of the individual. Those who are born blind, or who become so in infancy, depend on the remaining senses, which usually attain increased development, for the knowledge they acquire; but those who suffer loss of sight in adult life are often deprived of all resources by the calamity which has befallen them, deriving little additional aid from the other senses.

To some extent this infirmity arises from unpreventable causes, as when it is produced by the structural changes which accompany old age; but it is more commonly a consequence of diseases which are now regarded as preventable. Small-pox, as is well known, is one of the diseases upon which blindness frequently supervenes. Several other forms of disease equally tend to produce blindness. On the other hand, much may be hoped for from the counteracting effects of an efficient sanitary organization throughout the country, combined with the great advances which are being made in ophthalmic surgery.

There is reason, however, to believe that the educated blind are engaged in a greater variety of pursuits than is generally supposed. Amongst the items which present the largest numbers in the classification of occupation, are farmers, 331; agricultural labourers and farm-servants, 519; other labourers, 411; miners, 275; carpenters, 129,

shoemakers, 131; grocers, 135; army pensioners and soldiers, 81; navy pensioners and seamen, 134. Of the blind following employments presumed to have been acquired after loss of sight there are (males) 490 musicians, 595 basketmakers, 157 mat and sacking makers, 111 brush-makers, 44 chair-bottom makers. Of the female blind there are 218 domestic servants, 150 milliners and seamstresses, 55 music mistresses, 90 knitters, 81 laundresses, &c.

Institutions for the Blind.—The first regularly organized establishment for the charitable relief of the blind, is known as the Hôpital des Quinze-Vingts, in Paris. It was founded by St. Louis in 1260 as an asylum for his soldiers who had lost their sight in the East. It was designed, as its name implies, for fifteen score, or 300 blind; but it contains at the present time about 800 persons, including their families, for they are permitted to marry. No instruction of any kind is imparted to its blind inmates.

Although something had been done by ingenious blind persons and others to overcome the privation of sight by various contrivances, which substituted the touch of the finger for the lost sense, the first successful effort in systematic instruction was made in Paris by Valentin Haüy. Inspired by the success of the Abbé de l'Épée in the education of the deaf and dumb, Haüy believed that equally happy results could be effected for the blind, who were regarded as more helpless. He reflected upon the remarkable delicacy of their touch, which was rarely deceived in distinguishing the different coins; and it readily occurred to him that letters formed and printed in relief might also be traced by them. This was accordingly done; maps with raised boundaries, rivers, &c., were made; a class of blind children was collected and instructed, and the experiment was entirely successful. Such was the simple basis of the system which has been followed, with many improvements, in most parts of the civilized world.

A house was procured in 1784 in Paris, under the patronage of the Philanthropic Society; the school was organized under the immediate charge of Haüy. In 1786 he gave an exhibition of the attainments of his twenty-four pupils before the king and royal family at Versailles, when the institution was placed on a more permanent foundation by the royal bounty.

The active sympathy which their calamity has excited in England has shown itself in the establishment of asylums or schools for the blind, for the education of the young and their instruction in some mechanical art; associations have also been formed for supplying the adult blind with employment, for visiting the poor blind, for supplying them with home teachers, and for painting and distributing books in embossed type. In addition there are charities and funds, in some instances administered by the livery companies of the city of London, for the granting of small annuities to the aged blind.

Of these various agencies the most important are the institutions which afford to the blind moral and intellectual training by methods suited to their privation, with the means of learning some art or trade with the view of wholly or partially relieving them from dependence on their friends, their parishes, or the bounty of the benevolent. The first British asylum for the blind was established at Liverpool in the year 1791, and to the end of 1885 it had received over 2200 pupils.

The school for the indigent blind, St. George's Fields, Southwark, was established in 1799, and is the largest institution of the kind in this country. At first the pupils were few, only fifteen in the year 1800; the number is now 140. The institution is open to pupils from all parts, who are admitted by election, at ages between ten and twenty years. The funds of the charity are ample; it possesses a funded capital of upwards of £80,000, and an annual income of £7000.

At Norwich an asylum and school for the blind was

established in 1805 for aged persons and the young. The next institution for the blind founded in England was the Yorkshire school, instituted at York in 1833 in memory of William Wilberforce. Henshaw's Blind Asylum at Manchester was opened for the admission of inmates in 1838, and in the same year the Royal Victoria Asylum was founded at Newcastle-upon-Tyne. In the year 1838 also was founded "The London Society for teaching the Blind to Read and for training them in Industrial Occupations." The society established a school in the Upper Avenue Road, Regent's Park, for resident pupils and day scholars, who are taught by Lucas' embossed stenographic characters. Some of the pupils are employed in the printing or embossing office, some are trained to become tuners of pianofortes, and great attention is directed to the development of musical ability.

The institutions more recently established for the systematic instruction of the blind are the West of England Institution at Exeter, the Brighton Asylum for the Instruction of the Blind, the Catholic Blind Asylum at Liverpool, the Institution for the Blind and Deaf and dumb at Bath, the Midland Institution for the Blind at Nottingham, the General Institution for the Blind at Edgbaston, Birmingham; the Alexandra Institution for the Blind, the Hampshire and Isle of Wight School and Home for the Blind at Southsea, the Society for teaching the Blind and improving their social position at Swansea, the Normal College and Academy of Music for the Blind at Upper Norwood, which was founded in 1872 and has proved a great success. The education given in it has chiefly, but not exclusively, a musical direction—the object being to make the pupils comparatively independent in after-life by becoming organists and pianoforte tuners. The inmates have the advantage of attending all the Crystal Palace concerts and rehearsals. And lastly, in 1877, Mr. Henry Gardner left by will the munificent sum of £300,000 for the purpose of founding an institute for "instructing poor blind persons residing in England and Wales in suitable trades, handicrafts, and professions, especially in the profession of music." There are institutions for the blind in Edinburgh, Glasgow, Dundee, and Aberdeen; and in Dublin, Belfast, Cork, and Limerick. In America the system of training the blind is so admirable, that 50 per cent. of the adult blind are able to earn their own living.

On the Continent sound intellectual elementary education, accompanied by high proficiency in music, embracing study in harmony, composition, singing, and the practice of the organ, piano, harp, and other string and wind instruments, is considered best adapted to promote the worldly interests of the blind, to enable them honourably and effectually to earn their own livelihood, while music is a solace to them in their affliction, and calculated to elevate their minds both temporally and spiritually. Those pupils only are put to manual labour who have a *minimum* of general ability and no aptitude for music.

In England, speaking generally, the greater number of the institutions were founded and more particularly adapted for the teaching of trades and handicrafts, and music as a profession is a secondary consideration. It is obvious that in institutions supported by voluntary contributions, without endowment, handicrafts would be more remunerative, as they are less expensive in their teaching, and there are returns from the pupils, while music is more costly as regards both instruments and professional instructors.

Under the provisions of a recent Act of Parliament the guardians of any parish or union are authorized to send poor children to any school or institution certified by the Poor-law Board as fitted for the reception of such children, and to pay out of the funds in their possession the expenses incurred in the maintenance, clothing, and education of each child during the time such child shall remain at the school (not exceeding the total sum which would have been charged

for the maintenance of the child at the workhouse), such expenses to be charged to the same fund and in the same manner as the relief otherwise supplied to the child would be charged. It is manifestly the duty of the guardians to avail themselves of this provision of the law, by placing such poor children as are blind or deaf and dumb in the special schools, where they can be instructed in a manner suited to their condition, and in a great measure qualified to support themselves, instead of being a burden upon the ratepayers during the rest of their lives. To be fitted to become useful members of the community is a part of the relief to which these children are entitled.

Under the Education Act, that which was only permitted to boards of guardians is enjoined upon the school boards, which have no authority to exempt either the blind or the deaf from their operations; and hence the problem of education is so far solved that it has been committed by the legislature to definite and responsible public bodies, who have no excuse for neglecting it. The industrial training of blind children is placed by law on the same footing as their general education, and the industrial training of blind adults is in like manner provided for.

LUCAS' SYSTEM.

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VOWELS.

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hands several parts of the Bible, beginning with the Gospel of St. Matthew. It was found, however, that the characters, although clear and beautiful to look at, were not sufficiently distinct to the touch to be easily legible by its aid alone. Hence, in 1834, Gall introduced a new character, founded upon the ordinary Roman capitals, but with angles in lieu of curves. Alston, the Rev. W. Taylor, and others, especially in America, have invented and employed other modifications of the Roman letter; but all of them are open to the same objection. They do not fulfil to the finger the promise they make to the eye. They are mastered with great difficulty by those who become blind in middle life, and who, now that small-pox is kept in check by vaccination, form the great majority of blind persons. They look very distinct indeed; but the only proper test for them is the finger, unassisted by the sense of sight. A few of the blind, chiefly among those who have been so afflicted from early childhood, have cultivated delicacy of touch in an extraordinary manner; and the popular statements concerning them have produced a very general belief that the sense of touch, necessarily and spontaneously, by a sort of natural compensation, grows in acuteness with the loss of sight, and that most blind people have very good substitutes for eyes at the tips of their fingers. Such a belief is wholly erroneous. Acuteness of touch increases only by assiduous

Instruction of the Blind.—Of the many privations endured by the blind, and especially by those among them who have once enjoyed the power of vision, none are more acutely felt than their frequent inability to read and write. It is very difficult to realize all that this inability implies. It is, we fear, inevitable that the blind should be cut off from any unassisted knowledge of current or ephemeral literature; but a movement has recently been set on foot which promises to be successful, and which has for its object to restore to them the works of great writers, and to give them improved and easy means of holding written communication with others.

The idea of enabling the blind to read by touch is an old one, which would naturally suggest itself to all who were conversant with their condition. The first attempts at its practical application were made in the sixteenth century, but were not attended by any great success. The method of stamping characters on paper in relief was introduced by Hatii, who printed his first book in Paris in 1784, using the Italic form of the Roman letter. In 1832 Sir Charles Lowther obtained some types of this kind from France; and among other things, printed with his own

practice; and, moreover, can only be cultivated in a high degree by those who, being exempt from necessity for manual labour, can keep the organ of touch—that is, the skin of the finger-tips—in a condition of softness and delicacy. Many of the blind follow occupations which harden their hands, and could never acquire a very high degree of tactile sensibility. But when due allowance is made for increased delicacy of touch, it may still be taken as a fact that the Roman character, in all its modifications, is read by the blind with difficulty; and in proof of this the experience of American schools may be appealed to. Supported by public funds, these schools are called upon to furnish annual reports to the state legislatures. Among the pupils at the American schools in which a Roman letter is used, and after five years' instruction, one-third read fluently, one-third imperfectly, spelling the words letter by letter, and one-third failed entirely. At the Missouri Institution, where Braille's dotted character is employed, two-thirds of the pupils learn to read fluently, and one-third imperfectly. No failures are recorded.

In England there are no similar statistics to be obtained, but the practical difficulties arising from the Roman letter have made themselves unmistakably felt, and hence two systems of arbitrary signs have been introduced. That of Mr. Lucas, which is shown above, is based upon

ordinary shorthand, the signs representing the letters of the alphabet, and contractions being used when possible. A somewhat similar system by Mr. Frere is based on phonetic shorthand, the signs representing vocal sounds. Both render the books printed in them cheaper and less bulky than those in which common type is used, but they present great and often insurmountable difficulties to the uneducated adult blind.

Mr. Moon, who is himself blind, has devised a system in which many of the Roman letters are retained in simplified or rudimentary forms, while those which are more complicated are replaced by Mr. Frere's simple linear signs. Unfortunately, however, as will be noticed, while adopting some of Mr. Frere's signs, Mr. Moon has changed their meaning, and has thus introduced an unnecessary source of confusion. His method has the great recommendation of being very easy to acquire; but the books are bulky, which makes reading a slow process, and renders the cost of production very great. The following is the alphabet according to his plan:—

A	B	C	D	E	F	G	H	I
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
J	K	L	M	N	O	P	Q	R
J	<	L	Λ	N	O	Λ	Λ	Λ
S	T	U	V	W	X	Y	Z	&
Λ	—	Λ	Λ	Λ	>	Λ	Z	S

The foregoing brief sketch mentions only a few of the systems that have from time to time been introduced, and in which books have been printed. The blind forming as they do such a limited community, it is easy to perceive how seriously the growth of any literature for them must have been retarded by the division of effort which the conflicting systems have occasioned. A blind person, who has painfully acquired the power of reading one system, would have to rep at his labour in order to master another; and his difficulties would be increased by the circumstance already mentioned—that the same figure has been used for different purposes by different inventors. Thus, a single vertical line represents T in Lucas' system, T in Frere's, and I in Moon's. A horizontal line represents S in Lucas' system, N in Frere's, and T in Moon's; and there are similar differences in the signification of six other signs that are common to all, and of four that are common to Frere and Moon. The rivalry between the systems has kept the existing embossed literature within the narrowest bounds. In each the first idea has usually been to print the Bible; and so the whole Bible is absolutely printed in English in ten systems, and a great part of it in a fifth. There are a few small school books, some tracts, and some hymns—not always selected with the best possible judgment. The "Pilgrim's Progress" has been printed, as well as an abbreviated version of "Robinson Crusoe." A portion of "Paradise Lost" has also been printed in a contracted form of Moon's system.

It is satisfactory that amid this confusion the persons who are most interested have taken the matter into their own hands. In 1869 a society was formed under the name of the British and Foreign Blind Association, which includes among its vice-presidents and members men of the highest ability and social standing. The executive council consists of six gentlemen, of whom five are totally and one is partially blind. The members of this council are all able to read by touch at least three systems, and are pledged to be peculiarly interested in none. Besides comparing their

own experiences, they have been for some time engaged in receiving and noting down the evidence of a large number of blind who are able to read more than one system, and these readers have been specially examined with regard to their reasons for preferring one system or disliking another.

After extensive and persevering inquiries the council came to the conclusion in 1871 that the system which best meets the requirements of those who use it is the dotted system of M. Braille. Introduced into the Paris school in 1834 it grew steadily into favour until there was scarcely a country in the civilized world in which it is not widely known and used; while it is almost incredible that prejudiced opposition should so far have operated against it, that until 1869 it was scarcely heard of in the United Kingdom.

The dotted system is found to be far superior to any other for the purposes of writing and musical notation, and it possesses the great merit that the written is identical with the printed character, and can be read by the blind with the greatest ease. It is therefore invaluable for writing from dictation, exercises, &c. The council recommended Braille's as the educational system for all blind children, and for the every-day wants of all well-educated blind persons whose touch has not been seriously impaired by manual labour. For the old and dull of brain and touch they thought it advisable to have a simple line system approaching as near to the Roman as is compatible with perfect tangibility, and Moon's answers this purpose tolerably well. It is probable, however, that all books printed for the use of the blind will in future be done upon the dotted system.

The Braille method is now steadily progressing in England, and the association has done much to promote this end by introducing great improvements in the appliances used in the system. Very much greater accuracy and durability has been secured, together with the all-important condition of cheapness. This has been especially accomplished as regards the Braille writing-frames, which are now within the reach of every blind person who wishes to avail himself of the advantages of writing. A pocket writing-frame, with pocket alphabet and style, can now be obtained for one shilling.

For writing by this method the writer is provided with a plate of zinc, of any required size, having a surface grooved horizontally with twelve grooves to an inch, and surrounded by a frame like that of a common slate. A sheet of paper is placed on the zinc plate and secured, and is then crossed by a slip of thin metal, cut into two horizontal rows of oblong openings. Each opening is of the proper size to contain the six dots of the root form of the character. It is a quarter of an inch in vertical measurement, so as to correspond with three grooves of the plate below, and one-sixth of an inch wide. The spaces between adjacent holes are those proper to be left between letters. The writer is furnished with a blunt awl or stilet, and commences on the right-hand side of the page. Feeling for the first hole he forms within it the first letter by indenting on the paper the necessary dots. The grooves and the sides and angles of the hole are sufficient to guide his awl exactly, so that the dots are placed with perfect accuracy; and the grooves, although deep enough to allow the paper to be carried before the awl, are yet too shallow to allow it to be entirely broken through. When the sheet is completed it is turned over towards the left, and the stamped figures appear in relief, following one another from left to right.

As the system of M. Braille of Paris has met with so much favour from the association, we will describe it more fully. The symbols can be readily and perfectly produced by the blind by hand, and blind pupils, in the ordinary course of instruction, learn to decipher them by learning to form them. The blind can thus keep diaries and memoranda, make their own embossed books, and even carry on

any correspondence of a private nature; because any one who had business to transact with a blind person would readily learn to decipher and to form the letters—far more readily, indeed, than people in general learn to use the finger alphabet with the deaf and dumb. The basis or root-form of Braille's character is furnished by six dots $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$, arranged in three horizontal pairs; and every letter of the alphabet is represented by the omission of something from this root-form. The omissions are regulated on the most simple system. For all the first ten letters the two lower dots are omitted altogether, and each letter is formed by the two upper pairs, or by some further omissions from them. Thus—B is represented by $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$; C by $\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$; F by $\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$; H by $\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$; and so on. The next ten letters are formed by adding the left-hand dot of the lower pair to the former combinations, as L $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$ from B, M $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$ from C, P $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$ from F, and R $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$ from H. The remaining letters require both dots of the lower pair, as V $\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$, from B and L. The simpler forms, when standing alone, represent stops; and when following a particular prefix they represent figures. The following is the whole alphabet according to this system:—

A	B	C	D	E	F	G	H
$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ & \bullet \end{smallmatrix}$
I	J	K	L	M	N	O	P
$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$
Q	R	S	T	U	V	X	Y
$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$
Z	ç	é	à	è	ù	â	ä
$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$
î	ô	û	ê	ï	u	æ	w
$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$	$\begin{smallmatrix} \bullet & \bullet \\ \bullet & \bullet \end{smallmatrix}$

The same system is applied to music, and the arrangement is so simple that it can be very readily mastered by any person of ordinary intelligence.

In 1876 a writing apparatus was patented by Dr. Thurstfield of Shrewsbury for the use of persons who lose their sight when adults, or after having been well accustomed to the use of their pen. For those who become blind very early in life it is of comparatively little value; but the former class of persons, or those who may suffer from temporary blindness, may, by the aid of this instrument, retain a power of which probably they would otherwise soon be deprived. It consists mainly of a very ingenious arrangement for guiding the hand and pencil, by which the writing of a blind person is prevented from becoming an illegible jumble of letters and words. The apparatus is equally available for writing in a railway or other carriage, tunnels being no impediment, as any one accustomed to the writing can by its aid write as well in the dark as in the light. In the case of Dr. Thurstfield, as in many others, necessity was the mother of invention. He suffered from an affection of the eyes which would have seriously interfered with his professional duties but for the clever contrivance which he invented and perfected, and by which he was enabled to accomplish his necessarily large amount of official writing as medical officer of health for Shrewsbury, without any assistance from his eyes.

Closely connected with the question of printing and writing is that of music, in which the blind of England are very far behind those of France and other countries. Music,

even of the most complicated kind, can be written and read by the Braille method as easily as ordinary words. The extreme importance to the blind of a careful musical education may be judged of by the results arrived at in the Paris institution, where much attention is given to pianoforte tuning. About 30 per cent. of the male pupils obtain their diplomas as finished tuners, and are so much sought after that their success in life is certain; while many of those who cannot obtain their diplomas as tuners are able to maintain themselves as organists, teachers, &c. In England, unhappily, the prospect of a successful musical career for the blind has hitherto been very different, and this has been due in part to the absence of a good system of embossed musical notation. One of the first fruits, however, of the Braille system was a thoroughly intelligible and simple method of musical notation, and the establishment in 1872 at Norwood, near the Crystal Palace, of the Normal College and Academy of Music for the Blind previously alluded to. Here such effective instruction is given to the blind that many of the pupils have readily obtained engagements as pianoforte tuners, organists, &c. at a good remuneration.

BLIND SPOT, THE, in the eye. It is not generally known, except to those acquainted with physiology, that a considerable space of the retina is absolutely blind—viz. the part immediately surrounding the spot where the optic nerve enters the eye from the brain. This may be proved by the simplest experiments. One of the easiest is as follows:—

A

B

Let the reader close the left eye and look with the other at the letter A; he will clearly perceive the letter B also. Now let him hold up the book at a foot distance in front of the open eye, and move it towards him slowly, still looking with the one eye only at the letter A. It will be found that there is a point at which B has become invisible, for the image of B now falls upon the blind spot; the paper appears to be quite blank so long as the eye continues to regard A steadily. Neither still B comes into view again, the angle at which the image enters the eye now being sufficiently large to escape the blind spot. The same result occurs if the right eye is closed and the left eye is fixed on the letter B; the letter A (at a suitable distance, about 5 or 6 inches, generally) will then become invisible. The phenomenon is not usually perceptible, because it is impossible that both eyes should receive at the same time an image of the same object on their blind spot; one eye, therefore, covers the defect of the other in ordinary vision.

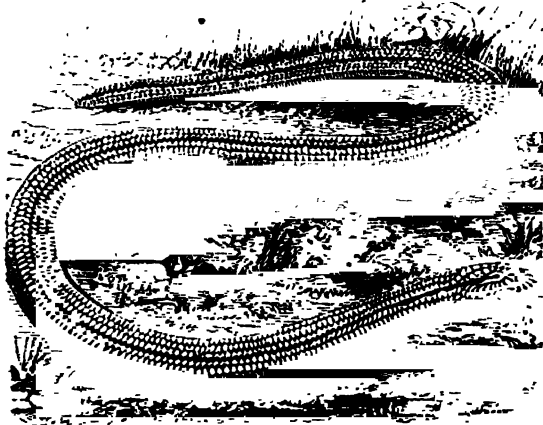
BLINDAGE (called also *Blind*) is a military building consisting usually of stout timbers, to secure troops, stores, or artillery. Of those which are executed in a fortress during a siege the simplest are such as are made against the side of some strong wall within the place, or (which is preferable) against the revetment of the counterscarp, in a dry ditch, or on any of the fronts not exposed to the fire of the enemy. These consist of thick beams placed close together, and leaning against the wall so as to make with it an angle of 45°, one extremity of each resting on a sleeper laid on the ground. In other cases the beams are placed at intervals from each other; over them are laid horizontal joints close together, and the whole is covered to the required thickness with fascines and earth. A blindage is sometimes formed by inclosing an area within a wall made of strong palisades planted vertically in the ground, the roof being of timbers disposed horizontally and close together, and above a bed of fascines and earth. This is generally constructed to serve as a field magazine, and to cover artillery on the ramparts of a fortress.

BLINDNESS. See EYE; BLIND, THE.

BLIND-WORM (*Anguis fragilis*) is a small LIZARD

nearly allied to the *SCINK*. It is serpentine in form, and in fact may be regarded as a connecting link between lizards and serpents. Though no traces of legs are to be seen, there are rudiments of a breastbone, the shoulder-girdle, and the pelvic arch. In the serpents the lungs and other paired organs are not usually symmetrical, and the blind-worm resembles them in that its left lung is only half the length of the right. Like serpents, too, the blind-worm casts its skin.

The Blind-worm, or Slow-worm, is a native of Great Britain, and is found in almost every part of Europe, excepting the extreme north, and is capable of enduring a much colder climate than most other reptiles, even of our own country. It is plentiful in Russia, Siberia, Poland, Denmark, and Sweden, as well as the more temperate parts of Europe, as far south as Italy. This reptile varies in length from about 11 inches to somewhat more than a foot, and instances have been given of its attaining more than double that length. The eyes are small (whence one of its names), and the irides are red. The head is small, the teeth are minute and numerous, the neck is slender, and thence the body enlarges, continuing of equal bulk to the tip of the tail, which ends bluntly, and is as long as the trunk or body part. The tongue is comparatively



The Blind-worm (*Anguis fragilis*).

thick and short. The scales are very smooth, shining, of a silvery yellow on the upper parts, and dusky beneath; the sides are of a somewhat reddish cast. Down the back extend three black lines, which change with age into different series of black specks, and at length disappear. The dusky belly and the reddish sides are marked like the back.

The blind-worm feeds on small slugs, earth-worms, insects, and the like. In this country it makes its appearance at an earlier season than any other of our scaled reptiles. It frequents warm banks, where, like almost all other lizards, it delights to bask in the rays of the sun. In autumn it retires under masses of decayed wood or leaves, or into soft dry soil covered with heath or brushwood. Its general habitation is in holes in the ground, which it bores for itself to a considerable depth, and from which it comes up for the purpose of breathing. The habits of the slow-worm are exceedingly gentle and inoffensive. Even when handled roughly, it rarely attempts to bite, and when it is irritated so as to induce it to seize upon the finger, the teeth are so small as scarcely to make an impression. In spite of these facts, and though perfectly innocuous, it has the character of possessing the most deadly venom, and is persecuted accordingly. The animal is very brittle, and when captured it throws itself into such rigidity that it sometimes breaks in two. A smart blow with a switch divides it; and from this fragility

Linnæus gave it the specific name which it still retains. The blind-worm is ovoviviparous. The young are hatched within the creature's body and brought forth alive. The number produced at one birth varies from seven to twelve or thirteen.

BLISTER, a term used to express a bladder or vesicle raised upon the skin by the application of some external irritating substance, and also to denote the external application itself by which this effect is produced. The term *resicatory* is also frequently given to the external application. The substance usually employed as a vesicatory is the powder of cantharides, or Spanish flies. The powder of cantharides is mixed with lard and wax, so as to produce a plaster of tolerably firm consistence, which is spread on leather, and applied to the part for the space generally of from ten to twelve hours. The first effect of the application of the blister-plaster to the external skin is to produce a sense of tingling and heat; this is followed by redness, commonly attended with pain, and subsequently there takes place an elevation of the cuticle into a vesicle or bladder, which contains a fluid resembling the serum of the blood. On the evacuation of this fluid the redness continues for some time, the serum gradually thickens, and at last is changed into a whitish curdy substance, under which new cuticle is formed, though occasionally the serum is converted into proper purulent matter, the blistered part successively contracting until the whole wound is healed.

Blisters are employed as counter-irritants, and are most commonly used in inflammatory diseases, as in pneumonia (inflammation of the lung), in gastritis (inflammation of the stomach), in hepatitis (inflammation of the liver), in phrenitis (inflammation of the brain), and so on; but there are diseases of the nervous system in which they are decidedly useful—as in spasmodic affections attended with pain but without inflammation, in the paroxysms of angina pectoris and of spasmodic asthma, in epilepsy, catalepsy, hysteria, paralysis, &c. Care must be taken, in the case of infants, young children, and of persons of advanced years, not to leave the blister on too long, as it may cause a painful sloughing wound very difficult to heal. In such cases, after it has been applied for a few hours, it should be removed and followed by a poultice. Persons suffering from inflammation of the kidneys should never use the cantharides blister, as it may bring about the discharge of bloody urine. Among other substances used to obtain a blistering effect are turpentine, mustard, cayenne pepper, strong vinegar, and liquid ammonia. Another method sometimes adopted by travellers who have none of the ordinary means at hand is to pour a small quantity of boiling water upon the flesh, a cloth wetted with cold water being held round the part to be blistered so as to limit the effect of the hot water.

BLISTER-BEETLE. See CANTHARIDE.

BLOCK, an appliance generally made of wood, but sometimes of iron. It is chiefly employed in the rigging of ships, to give facility to the raising or lowering of the masts, yards, and sails, and for such other purposes as require and admit of the application of the pulley—a block, as used on board ships, being simply a pulley in the greater part of its modifications. One description of blocks, to which the name of *dead-eye* has been given, is not a pulley, being unprovided with sheaves. These are used for setting up and fastening the shrouds and other standing rigging of the ship, while sheaved blocks are used for the running rigging. The more usual form of blocks of both descriptions is that of an oval spheroid, flattened at opposite sides. A dead-eye is made out of one piece of wood, pierced with the requisite number of holes, round and through which the standing rigging is passed. Sheaved blocks are made up of three distinct parts, viz. the shell, the sheave, and the pin which serves as an axis round which the sheave revolves. Some blocks are made with two, and others with three

and even four sheaves, which all revolve on the same pin or axis, and consequently parallel to each other.

The vast number of blocks constantly required for the use of the English navy and the mercantile marine of this country may be understood from the fact that upwards of 1400 blocks of all sorts are needed for fitting one ship of seventy-four guns, while for smaller vessels, although the sizes may be different, the number will not materially vary from what is here stated. It was, therefore, long a matter of considerable moment to devise means for simplifying the mode of manufacture, which requires great accuracy, and thus diminishing the cost. In 1781 a large manufactory was established at Southampton by Mr. Taylor, who had secured a patent for an improved method of making sheaves, and who further adapted machinery for cutting the timber and shaping the shells of the blocks. Mr. Taylor for some time supplied all the blocks required for the navy; but shortly after the expiration of his patent, machinery was introduced into the dock-yard at Portsmouth, and the government undertook the manufacture, with the double object of economy and of being independent of any individual for the supply of an article of first necessity for the equipment of ships. About this time (1801) Mr. (afterwards Sir M. I.) Brunel succeeded in completing a perfect working model for constructing both the shells and sheaves of blocks. This model being submitted to the inspection of the lords of the Admiralty the invention was at once adopted by government, and Mr. Brunel was engaged to superintend the construction of the requisite machinery upon a scale sufficiently large for making blocks to supply the whole naval service of the country. The completion of this machinery occupied nearly six years, and was not brought into full operation until 1808, after which it worked without requiring alteration. It consists mainly of an assemblage of saws and lathes, forming an extensive series of machines, all of which are set in motion by one steam engine. By some of these the legs of elm from which the shells are to be formed are cut up into pieces of suitable dimensions; others bore the holes for the pins or axles, and cut the mortices in which the sheaves are to be placed; others cut off the corners and complete the rounding and shaping of the shell by very ingenious arrangements; and another, the scoring machine, cuts the grooves intended to receive the rope by which the block is to be suspended. Another series of apparatus is provided for cutting the lignum vite of which the sheaves are made into slices, sawing them to a circular shape, and cutting a round hole in the centre, fixing in the centre hole a metal *coak* or ring, through which the axis is to pass, forming the groove in the edge of the sheave, and turning and polishing the iron pins for the axles. It is found that with this machinery ten men can perform the work that previously required 110, and can easily produce 140,000 blocks per annum. Mr. Brunel received £20,000 from government as a reward for his ingenuity; yet it is said that the *savings* of four years, as compared with the cost of blocks made in the former manner, were sufficient to defray this sum and the whole cost of erecting the buildings and machinery.

The rope (or iron) strop or binding which secures the wooden block by passing over its flatter sides has now generally given place to the inside binding shown in figs. 8 and 9 in the Plate Blocks. This is a forked forging which is built into the block, forming an eye or hook, with a swivel at one end receiving the pin of the sheave; and where required has an eye formed at the opposite end for the end of the rope or "fall" to be fastened to. This binding is less liable to wear, and it is both stronger and neater than the outside binding. Blocks formed with wrought or cast iron "shells" are also much used, especially where there is increased wear through chains being used in place of ropes, and where the blocks are not liable to chafe or come in

contact with less durable substances (see Plate Blocks, figs. 4-7, 10-13).

A considerable saving of power is made by the introduction of friction-rollers, fitted either in the sheaves or in the shell, so as to receive the pressure of the pin. These patented by Mr. W. J. Brewer (see Plate, figs. 14-16) are considered an improvement upon the roller sheaves, which are less accessible for lubrication, and very noisy when being used.

The double, treble, and fourfold blocks are shown on the Plate Blocks, figs. 1-3. Fig. 4 represents an iron snatch block; fig. 5, a gin or cargo block; figs. 6, 7, single and treble iron purchase blocks; figs. 8, 9, inside bound wood blocks; figs. 10 and 11, 12 and 13, hanging and leading blocks; figs. 14-16, Brewer's patent blocks.

BLOCK SYSTEM. In order to insure, as far as human foresight and ingenuity can, the safe working of railways, two distinct systems of safety appliances are called into requisition. These are the block system and the interlocking system. Briefly stated, the block system—which would be more correctly designated if called the "space" system—consists in preserving a certain definite space between trains running on the same line of railway and in the same direction. This is effected by electric signalling, which is carried on between signalmen at either end of a given section of a line—say between one station and another. The means by which the principle is carried out vary in detail on various lines, but for all practical purposes it may be taken that there are appliances which, if properly used, insure perfect safety so far as the signalling goes. In other words, the signalman at one end of a section can control the signals of the man at the other end, so that nothing but wilful disregard of the signals on the part of the engine-driver can lead to an accident.

The interlocking system relates to the points, and by it is understood a means of securing a perfect coincidence between the signals and the train course on the rails. In other words, it means that before a train can be signalled to approach, the route must be first prepared for it. Formerly the two systems—both excellent in themselves, but mutually dependent on each other—were worked separately, and consequently absolute safety was not insured. This possibility of conflict in working between the block and the interlocking systems had always been recognized by those who understand their details as the weak point in working railways under them, and considerable attention had been given to the subject by engineers and others, with a view of remedying the defect. At last, in 1878, it was ingeniously accomplished by Mr. C. Hodgson, the manager of Messrs. Saxby & Farmer's Railway Signal Works at Kilburn, who succeeded in effecting a mechanical combination of the two systems, thus eliminating the last atom of the element of human fallibility which remained for human ingenuity to dislodge. At the same time greater dependence is thrust upon the perfection of the mechanism. Thus an accident was caused by a railway signal becoming blocked with snow in a snow-storm, and being thus made unable to rise to "danger."

The apparatus by which this is accomplished consists of a frame, containing in its lower portion the usual levers for working the points and outdoor signals, and in its upper a series of train telegraph instruments for signalling and recording. From each of these instruments a rod or spindle passes down to a series of sliding bars which are slid at right angles to revolving spindles, moved by the point and signal levers. The bars are provided with steps or projections, which are engaged with, or disengaged from, the mechanism of the levers as may be required. These operations are performed by hand by means of a small handle or lever on the top of the telegraph instrument. At the same time contact is either made or broken in the telegraph line wire, and by this means the indications "line blocked" or

"line clear" are sent either up or down the line as circumstances require. We thus have a mechanical combination of the interlocking and block systems, in which both systems are operating at the same time and are made to work coincidentally. The invention thus carries the security of the interlocking system a step further, the levers of the points and signals and the handles of the telegraph instruments being interlocked reciprocally, with the result that if everything is kept in perfect order there cannot be any contradictory working between the outdoor signals and points, nor between them and the train telegraph signals transmitted electrically.

BLOCK TIN. When the crude tin has been obtained from the ores, the metal is allowed to run into moulds, and the ingots thus formed require further purification before the tin is brought into use. For this purpose they are gradually heated in a reverberatory furnace, when the purer metal melts first and runs off, forming *grain tin*. The remainder, which may contain arsenic, antimony, copper, iron, or lead, is then melted at a higher temperature, and when run into moulds forms the block tin.

BLOCKADE. A blockade consists in preventing ingress or egress at a seaport by means of vessels of war posted in front of it, or in surrounding a fortified place by a cordon of troops, in order to prevent supplies of provisions or warlike stores from entering, and to compel the garrison to surrender from famine or the failure of their ammunition. The generality of the ancient sieges were blockades, and two of the most memorable in Grecian history were those of Plataea and Pydna. The latter, before it surrendered, suffered the utmost extremity of famine.

When fortresses are situated on rocky eminences whose sides are steep by nature, or can be made so by human labour, or when they are approachable only by narrow passes, and the surrounding country is unfavourable for the execution of the works required in carrying on a regular siege, their reduction is most conveniently effected by a blockade; because they can be masked by a corps of troops not so numerous as to diminish materially the strength of the army in the field, and their garrisons, being necessarily small, are unable to attempt any serious enterprise. Towns may be blockaded when means are wanting to execute trenches, and when, besides, the place is known to be incompletely furnished with the necessary stores, and to contain a numerous population within its walls. In such circumstances it may reasonably be expected that the place will in time be surrendered.

In the establishment of a blockade, the outposts of the garrison are first driven as near as possible to the place, and bodies of troops, consisting of one or more companies, or even battalions, are disposed in convenient situations before all the accessible fronts; these are also strengthened at intervals by redoubts containing artillery, and if the place is on the sea-coast, a naval armament watches it on that side. Corps of cavalry and infantry are made to occupy any villages on the several roads by which it may be attempted to throw supplies into the place; advanced posts also, each consisting of a few men, watch the town closely, and maintain the communications between the different divisions of the blockading corps, by which means any movement of the garrison may be immediately discovered.

On the other hand, in order to counteract as much as possible the efforts of the enemy, all persons who cannot be rendered serviceable in the defence, or who cannot lay in a sufficient supply of provisions for their support during the probable continuance of the blockade, are sent out of the town; the necessary quantities of provisions and military stores are provided, and secured in casemates or shell-proof blindages. The garrison should keep the field as long as possible, disputing with the enemy every spot which he may endeavour to occupy, and destroying everything which may afford him cover.

BLOCKADE, LAW OF. Whenever a war takes place, it affects all states which have any connection with the belligerent powers. A large part of international law is that which respects such neutral states. For obvious reasons, this is also the most intricate part of the subject. There is a general rule that the neutral ought not to be interfered with; but to this rule there are many exceptions, derived from what is conceived to be the right of each of the belligerents to prosecute the object of annoying its enemy, even though (within certain limits) it inflicts injury upon a third party. In the first place, there is to be settled the question of what these limits are. It evidently would not do to say that the belligerent shall not do anything which may in any way inconvenience a neutral power; for such a principle would go high to tie up the hands of the belligerent altogether, inasmuch as almost any hostile act whatever might in this way be construed into an injury by neutral states. On the other hand, there is a manifest expediency in restricting the acts of belligerent powers, for the sake of the protection of neutrals, to as great an extent as is compatible with the effectual pursuit of the end for which war is waged. Accordingly it has been commonly laid down, that belligerents are not to do anything which shall have a greater tendency to incommode neutrals than to benefit themselves. It is evident, however, that this is a very vague rule, the application of which must give rise to many questions.

One of the most efficient modes of harassing an enemy is the blockade of his ports—thus preventing the ingress and egress of ships, merchandize, and valuable stores; and this, though injurious to neutral trade and commercial interests, is sanctioned by the law of nations. In order to constitute a valid blockade, it is necessary that a sufficient legal notice be given of its existence; and, according to the ruling of Sir William Scott in the case of the *Vrow Judith*, "a blockade is a sort of circumvallation round a place, by which all foreign connection and correspondence is, as far as human power can effect it, to be entirely cut off." Chancellor Kent, the great American authority, has thus stated the law in his "*Commentaries*" (vol. i. p. 150)—"A blockade must be existing in point of fact; and in order to constitute that existence, there must be a power present to enforce it." He also adds (vol. i. p. 151), that "the government of the United States has uniformly insisted that the blockade should be effective by the presence of a competent force stationed and present at or near the entrance of the port, and they have protested with great energy against the application of the right of seizure and confiscation to ineffectual or fictitious blockades." This practice was, however, very considerably relaxed during the American Civil War, the Federal States having been permitted to enforce an almost nominal blockade of the Southern ports, which was systematically evaded by merchant ships.

The rule also was signally violated in the war between England and France in the beginning of the present century, and accordingly in the year 1856, at the congress of the nations engaged in the Russian war then recently terminated, a declaration was entered into that "blockades to be obligatory must be effectual—that is to say, maintained by a sufficient force effectually to prevent access to the enemy's coast."

The usual penalty of blockade-running is the confiscation of the ship and cargo, though should it be satisfactorily established that the owners of the cargo, or any portion of it, are not implicated in the offence of the master of the ship, the innocent cargo will be restored; and, on the other hand, if the owners of the cargo alone are guilty, the ship shall be free, and the cargo only liable to confiscation. When a blockade has been raised by the enemy, or rendered abortive by the remissness of the blockading force, neutral traffic is again free, and continues so until a fresh

notice of the blockade has been published. The mere temporary suspension of a blockade from the unavoidable effect of storm or tempest, is not deemed a raising of the blockade, provided it be re-established with all possible despatch. Neutral vessels sailing in the immediate vicinity of a blockaded port incur the risk of seizure, search, and condemnation, and the cargo is liable to confiscation unless it be distinctly proved that there was no intention of violating the blockade, and that the vessel was brought there by stress of weather or other equally unavoidable circumstances. The offence of blockade-running is co-extensive with the voyage, and the ship can only be captured *in delicto*. The *delictum* ceases when the blockade is raised before the capture, the offence being no longer punishable, nor the vessel or cargo liable to confiscation. The offence of blockade-running is created either by taking into or bringing out of the intended port a cargo shipped after the commencement of the blockade; but neutral vessels in blockaded ports at the commencement of the blockade are allowed to proceed on their voyage with cargo *bonâ fide* purchased and shipped prior to the establishment of the blockade. When a blockade which was previously notified has ceased to exist, notice of its discontinuance should be given by the blockading power, so that neutrals may learn that their commerce is once more free and unrestricted.

Perhaps the most complete exposition of the modern doctrine of blockade may be collected from the judgments delivered during the course of the Napoleonic wars by Lord Stowell. Hamel's "International Law" contains a very succinct compendium of the law and authorities on this subject.

In this country a blockade is ordered and declared by the sovereign in council. It appears to be necessary for the sake of the public convenience that the power of declaring a blockade should, as far as possible, be exercised only by the sovereign power in a state.

Some very important questions connected with the law of blockade were brought into discussion, at the beginning of the present century, by the Berlin decree of Bonaparte and the orders of the King of Great Britain in council. The Berlin decree, which was issued on the 21st of November, 1806, declared the whole of the British islands in a state of blockade, and all vessels, of whatever country, trading to them, liable to be captured by the ships of France. It also shut out all British vessels and produce, both from France and from all the other countries then subject to the authority of the French emperor. By a subsequent decree, all neutral vessels were required to carry what were called letters or certificates of origin. There can be no question as to the invalidity of this blockade; the essential circumstance of a good blockade, namely—the presence of a force sufficient to maintain it—was here entirely wanting.

BLOCKHOUSE, among military edifices, is, as the name implies, a building constructed chiefly of timber; if alone, it constitutes an independent fort; if formed in the interior of a field-work, it becomes a retrenchment or redut, and serves to protect the defenders from the inclemency of the weather when the work is occupied during a considerable time, or to prolong the defence when the work is attacked, and after it is taken, to enable the garrison to obtain a capitulation. When the blockhouse is to be employed only as a retrenchment, its plan is generally a simple rectangle, and its walls consist of a single row of piles, placed upright in the ground; these are pierced with loopholes, at a distance of 3 feet from each other, in order that the building may be defended by a fire of musketry from within. The roof is formed by laying timbers horizontally across the inclosed area, and covering them with fascines and earth. The interior breadth of the building may be about 18 feet, in order to allow a passage between the two rows of bedsteads; these are placed with their heads to the side walls, and

serve as stages on which the men may stand to fire through the loopholes when the latter are much elevated above the floor. In a mountainous country the blockhouse possesses great advantages over an ordinary field-fort, inasmuch as the interior of the latter would be incessantly ploughed up by the fire of artillery directed into it by the enemy from the surrounding heights. Here, then, the blockhouse may with propriety be constructed as an independent work; its plan may have re-entering angles, or be in the form of a cross, in order to allow the faces to be defended by flanking fires of musketry from within; and the walls may be thick enough to resist the shot from 9-pounder guns. For this purpose they must be made by planting parallel to each other, at the distance of 3 or 4 feet, two rows of strong piles, those in each row being close together, and the interval between the rows being filled with earth up to the height of the loopholes, which should now be immediately under the roof of the building. The roof must be made shell-proof as before; but it has been recommended, when the work is not overlooked by the enemy, and when its breadth will permit, to have the piles forming the side walls long enough to rise above the roof, and either alone, or with a mass of earth behind them, to serve as a parapet. The American backwoodsmen are adepts at building blockhouses, some of which, with a curtain or continuous wall of stockading, are made to accommodate a great number of defenders. In European countries the base of a windmill on an eminence often formed a good blockhouse.

BLOIS, the capital of the department of Loir-et-Cher in France, stands on the right bank of the Loire on the railway leading from Orleans to Tours, from each of which cities it is distant about 35 miles. The population of the town in 1883 was 19,000.

Blois is neither a large, a well-built, nor a handsome town; on the contrary, many of its houses are mean and its streets narrow, crooked, and sometimes not accessible to carriages. But it is remarkable from the beauty of its situation, its antiquity, its monuments, and the historical events of which it has been the theatre. At one extremity of the town is the castle, and at the other the cathedral. The former is an immense pile, built at different epochs and in different styles of architecture. Louis XII. was born in this castle, and in it also Margaret of Anjou was married to the Duc d'Alençon, and Margaret of Valois to Henry IV. But it derives its principal interest from events of a very different character. Here in December, 1588, the Duc de Guise and his brother the cardinal were basely murdered by the order, and almost in the presence, of Henry III. This also was the scene of the imprisonment of Marie, and of the death of Catherine de Medici. The last rays of glory fell on this castle in 1814, when Maria Louisa held her court in it after the capitulation of Paris. The cathedral is a handsome edifice, as is also the bishop's palace, from the terraced gardens of which there is one of the finest, richest, and most extensive views in France. In the Church of St. Vincent are fine monuments to Gaston, Duc d'Orléans, and a daughter of that prince. The suburb of Vienne, on the opposite side of the river, is connected with the town by a handsome bridge of eleven arches, begun in 1717. The most ancient monument in the town is a superb aqueduct, ascribed to the Romans, cut in the solid rock. It is in excellent preservation, and conveys the waters of several springs a distance of about half a mile to a reservoir close to the town, whence they are distributed among public fountains dispersed in different parts of the city. Blois is the seat of a bishopric, a court of original jurisdiction, a communal college, two diocesan seminaries, a botanical garden (founded by Henry IV.), a public library with 20,000 volumes, a departmental nursery, &c. It has also a port well frequented by the craft navigating the Loire, a theatre, an abbatoire, and a *dépôt d'étatins*. It produces serges, hosiery, and gloves, cutlery and hardware,

and leather, and has a considerable trade in wines, spirits, timber, and other articles. Bernier, the celebrated Eastern traveller, was a native of Blois.

BLONDEL or **BLONDIAUX**, a French minstrel of the twelfth century, and the friend of Richard I. of England, whom he accompanied to Palestine. The tale of his discovery of Richard by singing an air, to which Richard responded, and which Fauchet gives on the authority of some old French chronicle, has furnished the subject of a well-known opera by Grétry. The story, however, has no historical foundation. Blondel must have composed much, but only a few of his poems remain.

BLOOD, a complex fluid existing in all the higher animals in tubes called bloodvessels; it is the great medium of exchange by which materials are supplied for the nourishment of the tissues and their waste products removed.

Human blood is a slightly viscid fluid with a faint odour, saltish taste, and a colour which varies from bright scarlet to dark purple red. It has an alkaline reaction with litmus paper, and its average specific gravity is 1.055. To the naked eye it appears homogeneous, but examined under the microscope it is seen to consist of a number of minute corpuscles in a transparent fluid (liquor sanguinis or blood plasma). The corpuscles form rather more than one-third, by weight, of the blood. They are mostly of two kinds, white and red (fig. 1). The white corpuscles are globular after death, but during life they undergo active changes of shape and position, throwing out arms or streamers, and often passing through the walls of the bloodvessels into the surrounding tissues. Their average diameter is $\frac{1}{300}$ inch. Naturally somewhat opaque from the presence of granules, they may be rendered transparent by the action of acetic acid, which brings into view a central part or nucleus,

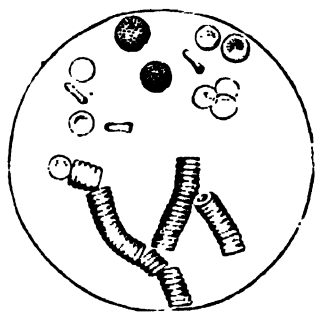
which also is stained more deeply by carmine than the part around it. These corpuscles are probably identical with those of the lymph, and are derived from the spleen, lymphatic glands, liver, and red marrow of bone, as well as from pre-existing corpuscles. The red corpuscles, when viewed singly, appear of a pale orange colour; their shape is that of a disc with slightly hollowed faces, about $\frac{1}{250}$ inch diameter and $\frac{1}{1000}$ inch thick. They do not present the active changes of shape observed in the white corpuscles, nor have they a nucleus. They are far more numerous than the white corpuscles, although the proportion varies. Thus during fasting there may be 800 red to one white corpuscle; while after a meal, when there are more white corpuscles, the proportion may be 300 to one. In pregnancy there is also an excess of white corpuscles; and in some diseases they may be nearly as numerous as the red ones. The coloured corpuscles are probably derived from the white, either from the whole corpuscle or from the nucleus alone. When worn out they are broken up in the spleen, and their colouring matter probably appears in the bile or urine. Other forms of corpuscles also exist, the nature of which is yet uncertain. The plasma of blood is a pale yellow transparent fluid, with numerous very minute granules, which are sometimes grouped in masses roughly resembling white corpuscles.

When blood is taken from its vessels and left at rest, it soon solidifies into a jelly-like mass which gradually shrinks, while a pale straw-coloured fluid appears around it and increases until the mass floats in the liquid. This process is called the coagulation of the blood; the more solid part is termed the clot or crassamentum, the fluid part the serum. The clot consists of a network of fibrin, inclosing blood corpuscles and some serum. The fibrin is

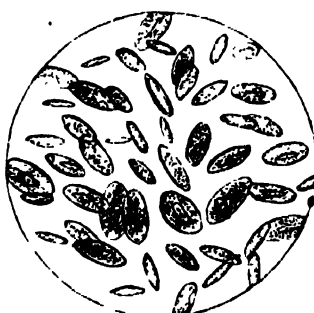
Fig. 1.

Fig. 2.

Fig. 3.



Corpuscles of Human Blood.



Corpuscles of Blood of Birds.



Corpuscles of Blood of Fishes and Amphibian.

derived chiefly from the blood plasma, in which its elements exist in solution. The red corpuscles tend to cohere by their faces, and so form columns like piles of coin (see fig. 1); and being heavier than the white corpuscles they sink to the bottom of the clot, which is correspondingly coloured. The part of the clot containing the white corpuscles forms the so-called buffy coat observed in febrile conditions (where coagulation proceeds more slowly).

The chemical composition of the blood varies considerably. The following is probably a fair average:—

Water,	781
Albumen,	70
Fibrin,	2.2
Red corpuscles (dry),	130
Fatty matters,	1.1
Inorganic salts,	6
Extractives and other matters,	6.1

1000.0

The plasma contains about 10 per cent. solids, chiefly serum albumen with small quantities of fibrin elements, fats, saline matters, urea, kreatin, sugar, and lactic acid. The quantity of fibrin obtainable from the blood is probably a measure of the amount of tissue-destruction in the body generally; hence its increase in fevers. The red corpuscles contain about 45.5 per cent. solids, the most important being hæmoglobin. This is a crystallizable organic substance, freely soluble in water and in serum, and blood-red in colour. It is a compound of globulin and hæmatin, to the latter of which it owes its colour. Hæmatin contains iron, and is capable of loosely uniting with an extra quantity of oxygen. It is this property which enables the red corpuscles to act as carriers of oxygen from the lungs to the tissues. The more highly oxygenated blood is scarlet, and is found in the arteries and left side of the heart; while that in the veins and right side of the heart contains less oxygen, and is more purple in colour. [See CIRCULATION.] The white corpuscles contain, besides albumen and other matters, a certain proportion of glycogen, which is a

substance resembling starch, and like it capable of conversion into sugar. It is chiefly found in the liver, but is present in all actively growing tissues. The salts of the blood corpuscles are chiefly chloride and phosphate of potassium, with smaller quantities of phosphates of sodium, calcium, and magnesium, and sulphate of potassium. In blood plasma, on the other hand, the chief salt is chloride of sodium (common salt), while the other salts mentioned above are only present in small quantities. The ultimate chemical composition of the blood closely resembles that of flesh or muscle.

The blood forms about one-thirteenth of the body weight in man; about one-fourth being present in the heart, lungs, and large vessels, one-fourth in the liver, one-fourth in the muscles, and the rest in other organs.

All vertebrate animals possess blood with red and white corpuscles, excepting the lancelet (*Amphioxus*) and the genus *Leptocephalus* of teleostean fish, which have only white corpuscles. In the lamprey and its congeners the red corpuscles are circular nucleated discs; but in all other fishes, as well as in amphibia, reptiles, and birds, they are elliptical and nucleated (figs. 2 and 3). The nuclei, however, are not visible during life. In mammals the red corpuscles are circular non-nucleated discs, excepting in the camel tribe, in which they are elliptical and non-nucleated. Great variations exist in the size of the red corpuscles: thus in the musk deer they are $\frac{1}{1250}$ inch diameter, while in Proteus (an amphibian) they are as large as $\frac{1}{100}$. Those of the mouse are larger than those of the horse; indeed, it is only in comparing animals of the same natural order that any correspondence is found between the size of the corpuscle and that of the animal. The pigment crystals obtainable from the blood also vary according to their source; thus in man they are in the form of long narrow prisms, in the guinea pig they are tetrahedral, and in the squirrel they consist of hexagonal plates.

Invertebrate animals frequently possess two circulations—one for watery fluid and the other for blood; but where corpuscles exist they are all colourless and nucleated. In the earthworm and a few other animals the watery fluid contains a red pigment in solution, which may have a respiratory function like the hæmoglobin in red corpuscles.

The temperature of the blood varies greatly in different classes of animals. In so-called cold-blooded animals (fishes, amphibians, and reptiles) the blood is only a few degrees hotter than the surrounding medium. In man it is about 100° Fahr. in health, being slightly warmer in the arteries than in the veins; while in disease it ranges from below 90° to 120°. In many quadrupeds the natural temperature is higher than in man: thus in the sheep it is 102°–103°. The blood of birds is still higher, being as high as 107° in the duck.

BLOOD, AVENGER OF. In the early ages of society, when patriarchal habits prevailed, it was a widely-spread custom for the nearest male relative of a murdered man to take upon him the duty of avenging his relative's death. The practice served to afford some little protection to life in the absence of settled government, but it was open to grave abuse, and in course of time it was modified by the substitution of a money payment made to the family or tribe of the murdered man, the death penalty being only exacted when this was refused. In the Mosaic law this custom was permitted to remain in force, but was placed under several regulations. Thus cities of refuge were appointed, where the man-slayer could be safe until his case had been judicially investigated, and where he could dwell unmolested if it was proved that he was not guilty of murder, but that the death had been caused by an accident. Another provision was that no money payment should clear a murderer, who should in all cases suffer the penalty of death (Num. xxxv.) The Koran also sanctions the practice of blood revenge, but allows the payment of money

to be accepted as a substitute. The custom remains in full force at the present day among the Arabs, and powerful confederations are formed for mutual protection founded upon this principle. An interesting account of the alliances, and the Arab law upon this subject, is given in "The Land and the Book," by Dr. W. M. Thomson.

BLOOD, THOMAS, a daring adventurer, whose villany has made him famous, was born in Ireland about 1628, where he entered the Parliamentary army, and was made a justice of the peace by Richard Cromwell. He joined the Royalists at the Restoration, and in 1663 he contrived a plot to seize on Dublin Castle, and on the person of the lord lieutenant, the Duke of Ormond. Being discovered he fled to Holland, many of his accomplices being arrested and executed. He afterwards came back to England, and again attempted the assassination of the Duke of Ormond, whom he caused to be seized in his coach in St. James Street on the night of the 6th December, 1670, and hurried away to Tyburn gallows. The duke struggled with his captors, and was rescued by the timely arrival of his attendants. Blood had contrived this plot with such skill that his share in it could not be brought home to him, and he was not even put on his trial for the offence. It was generally believed at the time that he was instigated to it by the Duke of Buckingham. His next enterprise, which may be regarded as his masterpiece of crime, was an attempt to steal the crown jewels from the Tower. Disguised as a clergyman, and attended by his accomplices, he obtained admission, and after nearly murdering the custodian, succeeded in getting off with the crown under his cloak, while one of his accomplices bore off the orb. They were, however, promptly pursued and arrested, and the jewels were recovered. Blood was committed to the prison of the Tower, but it was soon proved that he had powerful friends at court, who were not disposed to let him suffer for his offence. While in prison he was visited by the king, who not only gave him a free pardon, but conferred upon him a pension of £500 a year and an influential place at the court. The story generally circulated at the time as the reason for this change of fortune was that Blood had contrived to impress the king with the belief that he was a brave and injured man, and that he had been unjustly dispossessed of valuable estates in Ireland; another story represented the king as being terrified by the threats of Blood, who declared that he was a member of a powerful band which would certainly avenge his death; while many persons have supposed that both the king and the Duke of Buckingham were cognizant of the plot, and would have shared in the proceeds had the jewels been successfully carried off and sold. Certainly, while Blood was thus rewarded, the poor jewel-keeper, who had been injured, appealed in vain for a little recompense. On the break up of the Cabal ministry Blood quarrelled with Buckingham, and made a scandalous charge against him. He was arrested for this, but giving bail was confined at his own house, where, his health having broken down in consequence of his previous debaucheries, he died on the 24th August, 1680.

BLOOD-HOUND, the name of a hound celebrated for its exquisite scent and unwearying perseverance—qualities which were taken advantage of by training it, not only to the pursuit of game, but to the chase of man. A true blood-hound (and the pure blood is rare) stands about 28 inches in height, and is muscular, compact, and powerful; the forehead is broad, the muzzle long and deep, with pendulous lips; the nostrils are wide and well developed; the ears are ample and pendulous; the aspect is serene and sagacious; the tail is long, with an upward curve when in pursuit, at which time the hound opens with a voice deep and sonorous, that may be heard for a very long distance.

The colour of the true breed is almost invariably a reddish tan, darkening gradually towards the upper parts,

till it becomes mixed with black on the back; the lower parts, limbs, and tail being of a lighter shade, and the muzzle tawny.

This noble dog is now kept only as an object of curiosity and ornament, although it was once employed in the detection of deer or sheep stealers; indeed, we find it recorded at the beginning of the present century that "the Thrapston Association for the Prevention of Felons in Northamptonshire have provided and trained a blood-hound for the detection of sheep-stealers." Laid on the track of a marauder, the blood-hound kept up a steady and persevering chase, and was not baffled without difficulty. Even in 1876, it will be remembered, an instance occurred at Blackburn, in which the peculiar characteristics of the blood-hound were availed of, and successfully, for the discovery of an atrocious and cruel murder.

Blood-hound of Cuba.—The reputation which this variety has obtained for sagacity and fierceness, and the share that the terror of its name had in extinguishing the last Maroon war in Jamaica, render it an object of interest. This dog, introduced into the new world by the Spaniards, was employed by them in their conquest of America, and has since been reared more particularly in Cuba, whence its name. It is there used in the pursuit of murderers and felons, and also of wild bullocks.

With respect to its employment in the Maroon wars the following is a summary:—In 1733 the Maroons had become very troublesome, and the Assembly, among other plans for suppressing them, appointed garrisons, from whose barracks excursions were from time to time made against the insurgents. "Every barrack," says Bryan Edwards, "was also furnished with a pack of dogs, provided by the churchwardens of the respective parishes, it being foreseen that these animals would prove extremely serviceable, not only in guarding against surprises in the night, but in tracking the enemy. The first one war went on, however, till at last articles of pacification with the Maroons of Trelawney town were concluded on the 1st of March, 1738. This alliance continued, not without frequent complaints of the conduct of the Maroons, till July, 1795, when the Maroons broke out into open revolt, and waged a successful war against the government forces. At last the Assembly, in the month of September, remembering the expedient of employing dogs previous to the treaty of 1738, resolved to send to the island of Cuba for 100 blood-hounds, and to engage a sufficient number of Spanish huntsmen to direct their operations. After several delays, the commissioner who had been despatched to the Havana arrived at Montego Bay on the 14th of December with forty chasseurs or Spanish hunters, chiefly people of colour, and about 100 Spanish dogs. When these new allies were landed, the wild and formidable appearance of the men and dogs spread terror through the place. The streets were cleared, the doors were shut, not a negro ventured out, as the muzzled dogs, ferociously making at every object, and dragging forward the chasseurs, who with difficulty held them in with heavy rattling chains, proceeded onwards.

A sort of review was got up in order more effectually to display the strength and fury of these animals, which had nearly been attended with lamentable results: for so great was their impetuosity that General Walpole had some difficulty in getting into the chaise from which he had alighted, and had not the greatest exertions been made, his horses would have been torn to pieces. The scene answered the purpose for which it was got up. The terrified enemy at once submitted, and in June, 1796, the Maroons were expatriated to Halifax, in North America.

The pure-bred Cuban blood-hounds are of a tawny colour, with black about the muzzle; the ears are comparatively small, and the muzzle shorter than in the ordinary hound; in many points, indeed, they approach the mastiff, or bull-dog, especially in the form of the head. Hence, by

many naturalists, and with reason, these dogs are regarded rather as varieties of the mastiff than of the hound, or as of a mixed origin. Their height, at the shoulder is about 2 feet. They make excellent watch-dogs, and attack both the bull and bear with determined resolution. Many anecdotes proving their ferocious disposition and bulldog-like tenacity of tooth are on record, and some are of a most painful nature.

BLOOD-ROOT. See SANGUINARIA.

BLOOD-STONE or **HELIOTROPE** is a jasperine or crypto-crystalline variety of quartz, containing an admixture of a small percentage of oxide of iron and alumina. It is of a deep green colour, speckled with red, and is slightly translucent. From its fine colour and hardness it is often used for seals and signet-rings.

BLOODY ASSIZE was the assize held by Judge Jeffries in the west of England, in August, 1685, after the battle of Sedgemoor. Upwards of 300 persons were executed after very short trials; large numbers were whipped, imprisoned, and fined; and nearly 1000 were sent as slaves to the American plantations.

BLOW, JOHN, Mus. Doc., was born at North Collingham, Nottinghamshire, 1648, and educated in the Chapel Royal, London, on its re-establishment at the Restoration in 1660. While one of the "children" of that royal establishment he composed several anthems, which had the honour to be performed before Charles II. His advancement was rapid, for he was successively appointed to the offices of gentleman of the chapels royal and master of the children, one of the king's private musicians, composer to the king, almoner and master of the choristers of St. Paul's Cathedral, and organist of Westminster Abbey. In this last post he was both predecessor and successor of the gifted Purcell. Sancroft, archbishop of Canterbury, conferred on him the degree of Doctor of Music. He died in 1708, and was interred in the north aisle of Westminster Abbey (under the organ, as it used to be), where a monument is erected to his memory. Blow began writing early, and was very industrious. The list of his compositions is therefore very extensive. Fourteen church services and 100 anthems are only a part of his voluminous writings, all of them sound and scholarly works, and many in regular use in our cathedrals at the present day.

BLOW-FLY. See FLY.

BLOWN SAND, ÆOLIAN SAND, are accumulations above high-water mark along certain parts of the sea-coast, which are drifted by the winds, sometimes invading and smothering fertile tracts of land. This has been prevented in some localities by planting the sands with certain species of pines or other plants, whose roots bind the sand and prevent its travelling.

BLOW-PIPE and **ARROW**, a weapon used in many parts of the world, but chiefly by the Indian tribes of South America and the Dyaks and other native tribes of the Indian Archipelago. By the former the pipe is made of the stems of a small palm, and is generally from 8 to 12 feet long. The arrows, which vary in length among the different tribes from 1½ to 18 inches, are sharp-pointed and barbed, the point being cut half through so as to break off in the wound, and are poisoned with *urari*. This poison causes almost instantaneous death to birds, monkeys, or any small game, and does not injuriously affect the flesh, which is eaten with impunity by the Indians. The blow-pipe of the Malays is made of a reed, and the arrows, which are pointed with the sharp teeth of a fish, are also poisoned when used.

BLOW-PIPE. This instrument, in the simple form in which it has long been employed by jewellers and others in soldering upon a small scale, is a metallic tube 7 or 8 inches long, about a quarter of an inch in diameter at one end, and gradually tapering to a fine point, pierced by an extremely minute orifice at the other. The tube is bent

to a right angle about 1 or $1\frac{1}{2}$ inch from its smaller extremity; and the larger end being inserted in the mouth of the operator, it is used to direct the flame of a lamp upon the solder or other substance to be heated. The substance thus operated upon is laid upon a piece of charcoal held in the left hand of the operator, and a steady gentle current of air is impelled through the pipe by contracting the muscles of the cheek, the mouth having been previously inflated with air. The power of thus producing a blast without the aid of the lungs, and of respiring during the operation, is an important accomplishment, as without it the health may be injured by the use of the blow-pipe; and experience is necessary to enable the operator to regulate the strength of the blast, which if too great will diminish the heat by throwing too much air into the flame, and if too weak will produce a feeble flame. On examining the flame of a lamp or candle, it may be seen to consist of several portions of various degrees of brilliancy. (See Plate, figs. 13, 14.) Experiments prove that the central comparatively dark portion consists of gases which, owing to the want of contact with the oxygen of the atmosphere, are yet unconsumed and unchanged; that the next and most luminous portion consists of gases heated to a white heat; and that the very thin and less luminous cone which surrounds it consists of such portions of gas as, by their immediate contact with the atmosphere, are brought into a state of the most rapid combustion, and give out the most intense heat; the conditions of heat and light being thus far different, that while the former depends on the rapidity and energy with which the chemical combinations of combustion take place, the latter depends on the quantity of matter kept at a white heat, and the length of time it remains in that state. The points of greatest heat in an ordinary flame are found between the blue cup at the base of the flame and the slightly luminous external cone above described. When a current of air is directed into it by a blow-pipe at the side of the flame, it is thrown into a horizontal direction, and a long thin blue jet, corresponding with the blue cup of the natural flame, is thrown out from it. At the pointed extremity of this jet, within the most luminous portion of the flame, is the point of greatest heat; the high temperature being the result, first, of the concentration of the hottest portion of the flame into one point or focus; and secondly, of the circumstance that, while in the natural flame the points of greatest heat occur in the outer part, and are therefore rapidly robbed of their temperature by the surrounding atmosphere, they here occur enclosed by the luminous flame, which protects them against such loss. In the simplest form of blow-pipe, the collection of water from the condensed moisture of the breath prevents the continuance of the blast for any length of time. This inconvenience is avoided by making the blow-pipe in two pieces, and interposing between them a receptacle for retaining the water, and preventing its entrance to the finer portion of the pipe. The application of the blow-pipe to scientific purposes appears to have originated about 1738, when Antony Swab, a Swedish berg-rath, or counsellor of mines, employed it in the examination of ores and minerals. Cronstedt, whose system of mineralogy, based upon the chemical composition of the minerals, was published in 1758, by the employment of fluxes in the experiments performed with this instrument, may be considered the founder of a new department of chemical science; Bergman published a Latin treatise embodying the results of his researches with it in 1779; and Gahn, though he left no work on the subject, far exceeded any of his predecessors in experiments with this instrument, the results of which were subsequently given to the world by J. J. Berzelius, in a treatise of which English, French, and German translations have appeared. The various modes in which the blow-pipe may be applied in scientific investigation, either upon mineral substances alone or when

combined with fluxes or reagents, form an important part of the qualitative analysis of minerals. All engaged in mineralogical researches require skill in the use of this small, cheap, portable, and easily managed instrument. Different forms of blow-pipe are shown in the accompanying Plate. Fig. 1 represents the common form. Cronstedt gave to the instrument the form of fig. 2, wherein, by the addition of the bulb at *c*, a provision is made for the moisture of the breath as it becomes condensed. Fig. 3 represents the blow-pipe of Professor Tennant. To Dr. Wollaston we are indebted for the most portable form of blow-pipe. It consists of three pieces fitting within each other; in fig. 4 it is seen packed for the pocket, and fig. 5 represents the whole fitted together for use. That in most common use in chemical analysis is Black's (fig. 1). Fig. 6 is Hooke's alcohol blow-pipe; fig. 7 is the enameller's lamp; fig. 8, the hydro-pneumatic blow-pipe. The ordinary forms of blow-pipe are used by jewellers, also by plumbers for jointing gas pipes. In chemical works where solder is not used the joints are all made by melting the lead seams together by a hydrogen blow-pipe. A jet is used consisting of two tubes joining near the point; one tube conveys hydrogen, generated from zinc and sulphuric acid, and the other tube is connected with an air vessel supplying air by water pressure. The oxyhydrogen blow-pipe, in which hydrogen and oxygen are the gases used, is largely employed for producing the lime light, and affords the most intense heat known. A modification, in which the lime assumes the form of a crucible, is used for melting platinum on the large scale. A great variety of coal gas blow-pipes are now used in laboratory gas furnaces for increasing the heat by a blast of air; some are also used in soldering and brazing. Fletcher's (of Warrington) forms are shown in figs. 9 and 10, and his hot-blast blow-pipe in fig. 11. Very high temperatures are attained, and nickel is easily melted. The newest and most remarkable blow-pipe is Glimmingham's double-jet glass-blowers' blow-pipe, fig. 12. This apparatus in the skillful hands of the inventor, and in combination with the Sprengel pump, has rendered possible the manufacture of those completely vacuumous glass globes first used in Crooke's radiometers, and now in all the incandescent systems of electric lighting.

BLUCHER, LEBRECHT VON. Prince of Wahlstadt, and field-marshal of Prussia, was born 16th December, 1712, at Rostock, a town near the shore of the Baltic, in the duchy of Mecklenburg-Schwerin. His father was a captain of cavalry in the service of Hesse-Cassel. At an early age he manifested a strong predilection for the military profession, and in opposition to the advice of his relatives, entered in his fourteenth year a regiment of Swedish hussars as ensign. While in this service he was taken prisoner by the Prussians, and entered their service. Under Frederick he rose from a lieutenant to senior captain, when his pride being ruffled by the promotion of a person of higher birth than himself to the vacant post of a major, he resigned, and retired to the duchy of Silesia, became a farmer, and by persevering assiduity acquired possession of a considerable estate. He remained thus employed for fifteen years, until the accession, in 1786, of Frederick William II., by whom he was recalled, and reappointed to the rank of major in his old regiment of black hussars, which he commanded with honourable distinction in several campaigns against the French.

In 1790 he obtained the Order of Merit; and subsequently, in 1793-94, as colonel and major-general at the battles of Orthes, Luxembourg, Frankenstein, Oppenheim, Kirchweiler, and Edesheim in the Palatinate, he acquired reputation as a soldier by his vigilance, promptitude, and astonishing energy. In 1806, after the victory gained by the French at Jena, having, with a remnant of 10,000 or 12,000 Prussians, become separated from the rest, he succeeded without disorder in forcing his retreat westward

as far as Lübeck, and finally accepted a capitulation, only on condition that the cause of surrender should, in writing, be stated to be "want of ammunition and provisions." Having been exchanged for General Victor, he was sent into Pomerania to assist the Swedes. He was afterwards employed in the war department at Königsberg and Berlin; and when in 1813 his country rose in opposition to France he was appointed to take the command of a numerous army of Prussians and Russians combined, in which he distinguished himself at the battle of Lützen, and at those also of Bautzen and Haynan. In the battle fought, on 26th August, 1813, on the banks of a small river near Liegnitz in Silesia, called the Katzbach, Blücher first held undivided command, and with 60,000 men, the largest portion only raw militia, defeated the French marshals Macdonald, Ney, Lauriston, and Sebastiani. He now marched with amazing rapidity to the Elbe, passed over by means of pontoons, and pushed on to the important battle of Leipzig, to the victorious results of which his services greatly contributed. With his Russo-Prussian troops he now formed the left wing of the great army of the allies in their pursuit of Napoleon retreating towards France. Having passed the Rhine at Kaub and Coblenz, he took possession of Nancy in January, 1814. At Brienne he received a fierce attack from Napoleon; but, after various battles lost and won on the way to Paris, Blücher finally entered that metropolis, 31st March, 1814; and but for the intervention of the other commanders, it would by him have been made a scene of revengeful retribution. As characteristic of him, it is said that when he visited London, shortly after, he made the remark, as he looked around him, "What a city to sack!" He received honours and rewards from all quarters for his exertions, in possession of which he retired to his Silesian estate, residing there until the return of Napoleon from Elba in 1815, when again he returned to the great theatre of war, and assumed the command of the Prussian army in Belgium. His characteristic over confidence and precipitancy occasioned his defeat at the battle of Ligny, 16th June. But late in the evening of the memorable 18th of June, when victory seemed to hang doubtful, Prince Blücher appeared suddenly emerging from the forest of Ligny at the head of a great portion of his Prussian army, and, a simultaneous panic having seized upon the whole of the French forces and produced the utmost confusion, a general attack was ordered by the Duke of Wellington, which at once terminated in their perfect defeat. Blücher immediately gave orders to pursue the flying enemy; and a fierce and hot pursuit by sixteen regiments of Prussians was kept up the whole night, until the roads were clogged with the dying and the dead. Having arrived with his army at Paris, and assisted in the re-entrenchment of the Bourbon dynasty, he remained there several months. His health now beginning to decline, he retired to his chateau of Krasnowitz in Silesia, where he died on the 12th September, 1819, aged seventy-seven. The whole Prussian army went into mourning for eight days in his honour, and the old red uniform and the name of Blücher's Hussars was restored to his regiment by Frederic William IV. on the centenary of Blücher's birthday. Sadly deficient in the science of war, his bravery, obstinacy to defeat, and his impetuous marching and charging, gained him the title of "Marshal Forwards," by which he is still familiarly referred to in Germany. As a proof of the honour in which his memory is held, there may be mentioned the fact that during the war with France in 1870-71 a picture was published and widely circulated among the Germans, representing the old warrior, awakened by the crash of war, coming out of his tomb, and underneath it was placed the one word, "Forwards."

BLUE MOUNTAINS, in Australia, may be considered as beginning at Bass' Straits with the rocks of Cape Wilson, and running in a north-eastern direction, nearly parallel

with the shore. Several of the rivers flowing into Broken Bay originate in these mountains, as well as some affluents of the Macquarie River. In some places the hills come down to the very shores; at others they terminate at a distance of 30 miles and upwards from the sea. On the western side the mountains are less steep, and descend in terraces of considerable extent till they terminate in the low plains which occupy the interior of Australia. Copper, tin, lead, and coal have been met with among the Blue Mountains. The name is also applied to a lofty range in Jamaica, traversing the whole length of the island from east to west.

BLUE-BIRD, the American name for the *Motacilla sialis* of Linnaeus, *Sylvia sialis* of Wilson, *Saxicola sialis* of Bonaparte, *Ampelis sialis* of Nuttall, and *Erythraea sialis* of Swainson.

This harbinger of spring to the Americans, Wilson says, is known to almost every child, and shows as much confidence in man, by associating with him in summer, as does the red-breast in Europe by his familiarity in winter. "So early as the middle of February, if the weather be open, he usually makes his appearance about his old haunts—the barn, orchard, and fence posts. Storms and deep snows sometimes succeeding, he disappears for a time, but about the middle of March is again seen accompanied by his mate, visiting the box in the garden, or the hole in the old apple



The Blue-bird.

tree, the cradle of some generations of his ancestors." It is delightful "to behold his courtship and his solicitude to please and secure the favour of his beloved mate. He uses the tenderest expressions, sits close by her, and sings to her his most endearing warblings. When seated together, if he spies an insect delicious to her taste, he takes it up, flies with it to her, spreads his wing over her, and puts it in her mouth." The blue-bird is exceedingly bold and pugnacious, and its song possesses much sweetness. It makes its nest in holes in trees and similar situations; the eggs are a pale blue, five or six in number. Two or even three broods are reared in a season. The food consists of insects, and sometimes of fruits and seeds.

The blue-bird is common over North America generally, except in the higher latitudes. It is also found in Brazil, Guiana, and the Bahamas, probably its winter territories. It leaves the United States in November.

The upper plumage of this interesting songster is of a rich blue shot with purple; the quill and tail feathers are black, the under parts reddish chestnut, the bill and legs black. The female is duller in its colours. In length it is about 7½ inches.

BLUE-BOOKS, the popular name for the reports and papers printed by Parliament, which are uniformly bound or covered with blue paper. In France the publications of the government are bound in yellow, and hence are termed "livres jaunes." The practice of printing the proceedings

of the House of Commons commenced in 1681, and has been continued down to the present time. They now consist chiefly of the votes, proceedings, and Acts of Parliament; the public estimates; accounts of expenditure; correspondence connected with public affairs; reports of commissions, special and permanent; and of the proceedings of the different government departments. The results of a single session are thus set forth in some fifty or sixty thick folio volumes, but by means of an ingenious method of printing, and an annual index published with the last volume of each year, any subject can be readily referred to.

BLUE-BOTTLE, a pretty wild flower, commonly found in corn-fields. It is the *Centaurea Cyanus* of botanists. See CENTAUREA.

BLUE-BOTTLE FLY. See FLY.

BLUE-BREAST, the English name for a pretty song bird, which Bechstein regards as a link between the red-breast and common wagtail. It is the *Gorge-blue* of the French, *Motacilla suecica* of Linnaeus, *Sylvia cyanecula* of Meyer, Blue throated Warbler and *Sylvia suecica* of Latham, *Phonicurus suecica* of Selby.

The blue-breast is found in the same countries of Continental Europe which are inhabited by the red-breast, and particularly on the borders of forests; but is more rare in France and Holland than the latter bird. Bonaparte noted it as accidental in the neighbourhood of Rome, and as appearing only in severe winters. Bechstein says, "I often hear it said that the blue-breast is a rare bird; that in some parts of Germany it appears only every five or even ten years; but I can declare that this opinion arises from want of observation. Since I have taught my neighbours



The Blue-breast.

to be more attentive to the time of their passage, they every year catch as many as they please. It, in the first fortnight of April, up to the 20th, cold and snow return, plenty may be found by merely following the streams, rivers, and ponds, especially in the neighbourhood of a wood."

In England this species is of rare occurrence. The blue-breast breeds in the holes of trees; the eggs are of a greenish-blue colour. The food consists of worms and insects. The song of this bird is very sweet and agreeable.

The blue-breast is about 5½ inches in length; the crown of the head is amber brown, above the eye is a streak of yellowish white. The upper plumage is ashy brown, margins of the wings, coverts, and scapulars are paler, the throat and upper part of the breast is a rich azure blue, with a central spot of silky white; the lower part of the blue is bounded by a narrow gorget of black, succeeded by another of reddish brown; the abdomen is dirty or clouded white. Two middle feathers of the tail are dark brown, the rest orange brown as far as the basal half; the bill is brown. The colours of the female are paler and more obscure. The young are brown, spotted with white, and have a large white space upon the throat.

BLUE-EYE (*Entomya cyanotis*) is one of the largest and most beautiful species of the Meliphagidae (HONEY-

EATERS). It has only been met with in New South Wales, where, however, it is very abundant. It measures rather more than a foot in length; the plumage of the upper surface is of a golden olive colour, and that of the lower surface white; the head is black, with a large brilliant blue and green spot surrounding the eye, and there is a crescent-shaped white mark on the back of the head; the throat and centre of the chest are also black, leaving a continuous white stripe on each side. The blue-eye is a bold, pugnacious bird. According to Gould, it makes use of the large dome-shaped nest of a species of *Panatochimus*, a member of the thrush family, laying its eggs not within the nest, but in a depression on the top.

BLUE-PETER, a flag with a blue ground and a white square in the centre, hoisted as a signal that the ship is about to sail. Peter is a corruption of the French *partir* (to set out, to depart), the flag being hoisted to give notice that all about to sail in the ship are immediately to come on board.

BLUE-PILL (*Pilula hydraggyri*), the oldest and most popular of the mercurial pills, and which is said to have been first introduced by Francis I., king of France. It consists of two parts of mercury rubbed together with three parts of confection of roses, and sufficient powder of liquorice root to make one grain of mercury serve for a five-grain pill. It is in very common use as a purgative, a blue-pill, followed by a black draught, being often employed in cases of torpid liver, with a confined state of the bowels.

It is also used in combination with other drugs, such as rhubarb, colocynth, &c., for the same purpose. In another combination, viz. with a small quantity of opium, it is sometimes used to bring the constitution under the influence of mercury, the opium preventing its purgative effect. One form of this preparation consists of a pill made up of two grains of blue-pill to one-sixth of a grain of opium, which may be taken twice or three times a day, until the gums begin to be tender and sore, when it should be discontinued. It is a rather dangerous medicine to use, and persons taking it should be careful to avoid all sudden changes of temperature. It is also found in medical practice that some persons are very susceptible to the influence of mercury, and a comparatively small dose may produce alarming results.

Even when used as a purgative caution is necessary, as when constantly employed it may give rise to salivation and the other injurious effects of the over-action of mercury.

BLUMENAU, a village in lower Austria, celebrated as having been the scene of a severe engagement between the Austrians and Prussians on 22nd July, 1866, during the march of the latter to Vienna, after the battle of Sadowa. Whilst the fight was at its height, news arrived of the armistice which had been agreed to at Nikolsburg. Hostilities, of course, immediately ceased, and at night the opposing forces bivouacked together.

BLUMENBACH, JOHANN FRIEDRICH, a celebrated German physiologist and naturalist, was born at Gotha on the 11th of May, 1752. He studied at Jena and at Göttingen, took his degree as a doctor of medicine in 1775 at the latter place, and in 1776 was appointed curator of its museum of natural history. In 1778 he was appointed to the chair of physiology and anatomy in the university. As a teacher on this subject he became celebrated throughout Europe, and at an early age attracted students around him from a distance. One of his earliest and most distinguished pupils was Alexander von Humboldt. He was amongst the first to recognize the necessity of studying zoology in connection with comparative anatomy; hence the popularity of his lectures and the influence he exerted upon the study of organization in Europe. In 1781 he published a work on embryology, and was the first after Harvey who treated this subject in a scientific manner. In 1786 his work entitled "The History and Development of

the *Bones of the Human Body*" appeared. In the same year he also published, in Latin, an introduction to medical literature. In 1787 he produced his "*Institutiones Physiologicae*." This work was written in Latin, and was one of the first attempts at giving an account of the functions of the human body, independent of minute anatomical descriptions. It soon became the text-book in all places where physiology was taught, and was quickly translated into most of the languages of Europe. In 1805 Blumenbach published "*A Manual of Comparative Anatomy*." Two translations of this work appeared in English, besides others in the French, Dutch, and other European languages, and it soon led the way to more detailed treatises, which have since taken its place as a text-book in our medical schools. During the whole of his life Blumenbach never lost sight of the subject of the anatomical structure of the varieties of men. He was the first to point out the necessity of studying the structure of every part of the skull, in order to obtain anything like distinguishing characters between the varieties of mankind. In prosecuting this subject he collected a large number of skulls belonging to the various races of men. In 1791 he commenced the publication of a work in parts, devoted to the description and illustration of this collection of skulls. It was entitled "*Decas Collectionis sive Cranium diversarum Gentium Illustrata*." This work extended to several volumes, and was finished in 1808. From 1789 to 1794 he edited a medical periodical entitled "*Medizinische Bibliothek*," which contains many of his own contributions to science. He contributed also a large number of papers to other journals. In 1812 he was made secretary to the Royal Society of Sciences at Göttingen. In 1816 he was appointed physician to the King of Great Britain and Hanover, and in 1821 was made a knight commander of the Guelphic order. In 1831 he was elected a member of the Academy of Sciences in Paris. He died 22nd January, 1840.

BLUNDERBUSS. See ARMS.

BLUSHING is the result of a modification of the circulation through emotion. A nervous impulse started in the brain—whether yielding pleasure or pain matters not—effects the central nervous system, and this in turn reacts upon the vaso-motor fibres of the sympathetic nerve which controls the arteries of the face and neck. These arteries are no longer kept in check by the nerve, and dilate, admitting a sudden rush of hot red blood which heats and reddens the skin in the manner so familiar to all. It is manifest that either the sympathetic nerve would have the same effect; and this experiment has been tried on rabbits, the effect being plainly observable in the delicate skin of the ear. If now the cut end of the nerve be irritated, the opposite effect is produced—an intense shrinking of the arteries is produced, and the blood is driven from the head, leaving a cold pallor and an almost bloodless condition. This explains why many persons turn pale from exactly the same emotions of shame or of pleasure which cause blushing in others. If the sympathetic nerve is strongly excited as a result of emotion, pallor ensues; if it is over-wrought into temporary paralysis, congestion—that is, blushing—is the result, and the latter effect is by far the more usual.

BLYSMUS is a genus of plants belonging to the order CYPERACEÆ. The spikelets are terminal and compound; the spikelets with two to eight flowers; each flower has three stamens and divided style; there are 3-6 bristles scarcely equalling the plume; the two lowest glumes are broader and empty. *Blasmus compressus* is found in boggy pastures in Great Britain. *Blasmus rufus* inhabits marshes near the sea on the northern and western coasts of the British Isles.

BO TREE. The Popul of the Chinese, is the *Ficus religiosa* of botanists. It is sacred to Buddha, and highly venerated by his followers. See FIGUS.

BOA, the name of a family of serpents, including the PYTHONS of India and Africa, destitute of venom, but formidable from their enormous size, vast muscular power, and mode of attack. They lurk in ambush, dart upon their victim, and enveloping it in their powerful folds, speedily crush it to death or strangle it. The species of the restricted genus Boa are all natives of the tropical regions of America, and are characterized by the plates on the under surface of the tail being single. Both the boas and the pythons are most beautifully coloured, and gleam in the sun.

The boas and pythons are admirably adapted for predatory habits; their teeth are terrible, and produce a dreadful wound; and they maintain their hold with the utmost obstinacy. The teeth are simple, conical, sharp, and directed backwards; above there are four rows, viz. a row in each branch of the upper jaw, including the intermaxillary bone, and a row on each side of the palate, rooted in the palatine and pterygoid bones; a row of teeth crowns the ridge of the anterior portion of each ramus of the lower jaw. The lower jaw is not articulated directly with the skull, but with a movable "quadrate bone." This, combined with the extreme flexibility of the muscles of the jaws, enables these constricting serpents to swallow easily very bulky animals. The neck is slender, the body increasing gradually in diameter, and decreasing towards the tail. The tail is a grasping instrument strongly prehensile, and is aided by two hook-like claws or imperfect limbs at its base underneath. Though nothing beyond these spurs appears externally, yet internally is found a series of bones representing those of the hinder limbs, but of course imperfectly developed; these bones, however, are acted upon by powerful muscles, and can be so used as to antagonize with the tail, while grasping any object, and thus afford a fulcrum for giving additional energy to the prehensile tenacity of that organ. Securing itself to a fixed point by means of its tail, the strain which the boa, or the python, is enabled to exert on its vainly-struggling prey is prodigious. Although the term boa is now restricted by zoologists to an intertropical American group of serpents, it is a classical name, and was applied by the ancients to various huge snakes not only of southern Europe, but of India and Africa. Pliny says that the name was originally given to these serpents, because they were supposed to be nourished at first by sucking the udders of cows. These, as the accounts of various writers of classical antiquity prove, were constricting serpents; those, for example, of Libya, described by Aristotle, dangerous even to the tireme vessels; those pictured by Virgil as crushing in their folds Laocoon and his sons; and that great snake which had his lair on the banks of the Bagradas or Magradas (Mejerda), near Utica, and which terrified the Roman troops under Regulus. The huge serpents of India, capable of swallowing cattle, were evidently not unknown (Pliny; Arrian). Indeed the ancients seem to have been even more familiar with large snakes than we are. Constricting snakes of vast size, both of India and North Africa, were well known to the Romans. Perhaps in early times true pythons or boas were natives of south-eastern Europe, as was the lion, and have, like that quadruped, become gradually extirpated there. Pliny ("Hist. Nat.," viii. 14, "De Serpentibus Maximis et Bois") speaks of the serpent on the banks of the Bagradas, above alluded to, as matter of notoriety, observing that it was 120 feet long, and that its skin and jaws were preserved in a temple at Rome till the time of the Numantine war. He adds, that the serpents called boas in Italy grow to such a size, that in the belly of one killed on the Vatican Hill, in the reign of Claudius, an entire infant was found. Suetonius ("Octav.," 43) mentions that a serpent 50 cubits long was exhibited in front of the Comitium.

These formidable snakes tenant hot morasses, borders

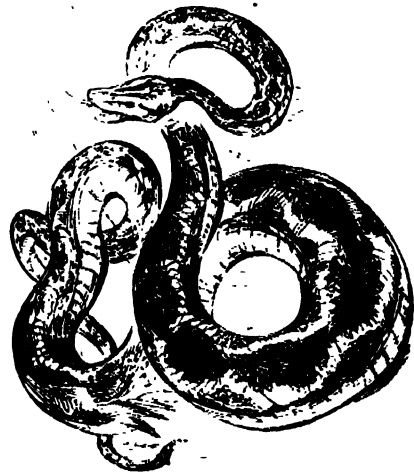
of rivers, and the tangled underwood of dark forests. Often half floating in the water, concealed amidst luxuriant herbage, with the tail grasping some branch or adjacent tree, they wait in ambush for their prey. "The footsteps of their unsuspecting quarry are heard as it comes to quench its thirst; the snake raises his head, glances upon his prey, then instantly lowers it, and prepares for the attack. All is silent, the creature draws near; it stoops to drink; suddenly, like a flash of lightning, the snake darts upon it; the water is lashed to foam; a cry of pain and terror—and all again is silent; the animal is quivering in the coils of the mighty snake, and life is soon crushed out; and now, gradually relaxing his accumulated folds and knots, the monster disengages himself and prepares to gorge the prey; he glides round it, with eyes glaring upon it; ever and anon he touches it with his bifid and quivering tongue, and soon commences to draw it in, beginning at the head, which first disappears. The mouth drips with a glutinous saliva; the jaws are all distorted; the working of each is visible, and also of the muscles of the head and throat. The skin of the neck is stretched, and appears as if it would burst the next instant; yet still the operation proceeds. So lost now is the snake to everything else, that it may be approached, struck, or even wounded, without ceasing its efforts, which increase with the difficulty occasioned by the bulky body of its prey. By slow and most energetic efforts, the whole at last is gorged; and now the bloated monster quietly seeks his accustomed retreat, and, coiling himself round, sinks into a torpid state, which continues for a month, when, reanimated and with renewed vigour, he leaves his lair, and issues forth to lurk again in ambush and seize another victim."

It is not quadrupeds only that fall a prey to these serpents. Large fishes are not secure: as they rise near the surface they are seized in an instant, and dragged ashore. Nor indeed are the monkeys safe in their arboreal homes. To swim, to climb, to swing suspended by the tail, like some huge vegetable creeper, from a branch vibrating to and fro, are modes of action alike in the power of these dreaded reptiles; nor knows the victim, till clasped, of the immediate presence of his terrible enemy.

In all ages, and in all climes, especially in such regions as are inhabited by snakes, formidable either for their bodily strength, or their "too potent" venom, serpent-worship has ever prevailed. At the first discovery of Mexico by the Spaniards, snake-worship was very common, and the idols have been described by the early historians of the conquest. Southey, in his fine poem of "Madoc," describes this horrid worship, the idol, and the priests.

The *Boa Constrictor* is a native of Brazil, Para, and some of the West-Indian Islands, and is particularly abundant in Surinam. This serpent is remarkable for the beauty and variety of its colours. The body is very thick in the middle and a little compressed, but becomes considerably more slender towards the tail, which organ is only about the sixth or seventh part of its total length. The head is heavy looking and thick, elongated, distinct from the neck, and heart-shaped. Its prominent muzzle and swollen cheeks and region above the eye, give it an air of ferocity which in reality, however, does not belong to its character. The eye is small, lateral, and has a vertical pupil. The colour of the ground is a rosy purple, varied and marbled with pale brown. On the under surface and towards the tail this passes into white, but on the upper parts, on the contrary, into a pale chocolate brown. A broad brownish-black ray runs along the sides of the head to behind the nostrils, and extends in a serpentine form along the neck and along the flanks, enlarging at irregular intervals in order to unite with that of the opposite side. The tip of the tail is generally of a red colour. The scales of the body are remarkably smooth, and extend also over the whole head, so that it possesses no plates except those of the lips, which are also smooth, and not pitted. Very

exaggerated statements have often been made as to the size of the boa, partly owing to many authors confusing other species of the family with it. Modern travellers have seldom seen it exceeding 12 feet in length, though individuals are mentioned as much surpassing that extent. It is often tamed, and it contracts habits so inoffensive, that in Surinam it holds the rank of one of the domestic animals, with which it frequently lives in perfect harmony. The boas appear to prefer the woody parts of the interior to the open places near the coast, and in such places, and in the large forests of that country, they are often to be seen, either hanging suspended to a branch of a tree, waiting for their prey, or retired into holes in the clefts of rocks or under the trunks of old trees, collecting there in small companies of several individuals. Their food consists of the small mammalia of that country, such as rats, mice, agoutis, pacas, and capybaras. The adults, however, are said sometimes to attack goats. Unlike the pythons, the boa never goes into the water, but lies concealed in burrows, the entrance into which is easily recognized by its being regularly, as it were, polished by the rubbing of its huge body against



The *Boa Constrictor*.

the sides. It is caught by the Brazilians placed nets at the entrance of this burrow, and these serpents are hunted thus for their skin and fat. Of the former they make boots, saddle-cloths, &c., and the fat is used for anointing painful joints, &c.

The Abomay (*Boa constrictor*, Linnaeus) is a native of South America and the West Indies. It is about 6 feet long, about as thick as a child's arm, and is remarkable for its fine colours. The ground colour is a more or less deep bar clear reddish brown fading into yellow, and a double row of round brownish yellow spots edged with black runs along the upper parts, which, however, often become confluent, running into each other, and then forming a single row of large spots. On the flanks three other rows of blackish-brown colour may be seen. The head of the abomay, which is nearly of the same size as, and on a line with, the trunk, is small, narrow, elongate, conical, and flattened on the crown. The muzzle is very compressed and prominent, forming a kind of nose. The nostrils are open, lateral, and are placed very near the extremity. The tail is very short, conical, always curved inwardly, and terminates in an obtuse point. It ascends trees, and often establishes itself in hollows in the ground, but never frequents the water. Its food consists of small mammalia.

The largest of all the serpents belonging to the boa

family is the great water serpent, the ANACONDA (*Eunectes murinus*).

BOADICEA (*Boudouka* in Dion Cassius) lived in the middle of the first century, and was the wife of Prasutagus, the king of the Iceni, a tribe of Britons inhabiting Norfolk and Suffolk. Prasutagus at his death bequeathed his wealth to his two daughters and to the Roman emperor. Nero was at this time emperor, and Suetonius Paulinus, a general of great skill and energy, commanded in Britain. While Suetonius was occupied in attacking the Isle of Anglesey (then called Mona), Boadicea was scourged and her daughters violated by the orders of the Roman procurator Catus, for some cause not recorded. The crime, however, brought its punishment. The Iceni and their neighbours, the Trinobantes (who dwelt in what is now Essex and Middlesex), flew to arms under the leadership of Boadicea. They first attacked and destroyed the Roman colony of Camalodunum (Colchester), and defeated a Roman legion which was coming to the relief of the place under the command of Petilius Cerialis. The insurgents also massacred the Romans at Verulamium (St. Alban's) and at Londinium (London), which was already famous for its commerce. Tacitus says that the Romans and their allies were destroyed to the number of 70,000. Suetonius hastened to the scene of this revolt, met the Britons, and totally defeated them. 80,000 Britons fell in the battle, and Boadicea killed herself by poison, A.D. 61.

BOAR. See HOG.

BOARD, a word used to denote, in their collective capacity, certain persons to whom is intrusted the management of some office or department, usually of a public or corporate character. Thus the lords of the treasury and admiralty, the commissioners of customs and inland revenue, the lords of the committee of the privy council for the affairs of trade, &c., are, when met together for the transaction of the business of their respective offices, styled the Board of Treasury, the Board of Admiralty, the Board of Customs, the Board of Inland Revenue, the Board of Trade, &c. The same word is used to designate the persons chosen from among the proprietors to manage the operations of any joint-stock association, &c., who are styled the Board of Directors. In parochial government the guardians of the poor are called the Board of Guardians, and the district educational authorities are now familiar to us as the School Board. The word *barreau* in France is an equivalent expression.

BOAR-FISH (*Capros aper*) belongs to the family Carangidae and the order ACANTHOPTERYGII, its nearest allies being the HORSE-MACKEREL and the PILOT-FISH. The body is short, much compressed, and covered with small serrated scales; the mouth is capable of considerable protrusion; the first dorsal fin is provided with nine spines, the anal with three; the ventral fins are well developed. Minute teeth are found in the jaws and on the vomer; there are none on the palatine bones. This fish appears to be most generally about 6 inches in length, of a pale carmine colour above, and silvery white beneath. It is a native of the Mediterranean, and has been not unfrequently found on the south coast of England.

BOAT, a general term for a small open vessel which is too well known to need any particular description. We will, however, give the names of the chief varieties of boats supplied to ships of war. They are—the *long-boat*, which is the largest carried, and is furnished with masts and sails; it is now often propelled by steam. It is either armed, and used for attacking places or vessels in situations out of the reach of a ship, or it is employed to fetch water, wood, provisions, or heavy stores on board. The *launch* is longer than the long boat, and as it is also more flat-bottomed, and does not consequently draw so much water, it can be propelled more rapidly. The *barge* is a long narrow boat, chiefly employed for conveying the chief

officers to and from the ship. The *pinnace* is a boat of a similar kind, but smaller, and is chiefly used by the inferior officers. The *cutter* is broader, deeper, and shorter than either of the preceding, and is generally used for the conveyance of light stores and the crew. The *jolly-boat* is made precisely similar to the cutter, but smaller; and the *gawl* is of the same kind and used for similar purposes as the two preceding, but is smaller still. The *gig* is a long narrow boat used by the chief officer when extra speed is requisite. Merchant ships have seldom more than three boats, unless they are specially designed for the conveyance of passengers, in which case they are compelled by law to carry with them as many boats as would contain the whole of the passengers and crew in case of necessity. For further particulars see article BOAT-BUILDING.

In 1873 a report was presented to Parliament from a committee appointed to investigate the means adopted in H.M. navy for saving life at sea, especially with reference to the nature of the boats and boat-lowering apparatus in use. From this report it appears that the measures adopted for saving the lives of men who fall overboard are superior to anything to be found in the merchant service. Life-buoys of two descriptions are always ready to let go instantaneously; men are stationed by them day and night; quarter-boats are always ready to lower; life-belts are at hand; boats' crews are mustered in every watch, and kept in readiness to man the boats; and signal-men are properly stationed to keep sight of the man in the water, and direct the boats when lowered. Life-boats are not used, as they are less easy to handle and far more difficult to hoist up again into the ships than a cutter; and the crew being more used to the latter, it is in any emergency used with much more facility than the more heavy and unwieldy life-boat would be.

Life-boats.—A life-boat is a boat constructed with great strength to resist violent shocks, and at the same time possessing sufficient buoyancy to enable it to float, though loaded with men and filled with water. Such boats are maintained at most of the ports of this kingdom, always ready to put to sea when vessels are seen in danger of shipwreck, and provided with means for being conveyed to the shore, and launched as rapidly as possible. As early as the year 1785 a patent was granted to Mr. Lukin for a life-boat with projecting gunwales and hollow cases or double sides under them, as well as air-tight lockers or inclosures under the thwarts; these contrivances increased the buoyancy of the boat, and the air tight cases under the gunwales, by their weight when raised above the surface of the sea, and their resistance when depressed beneath, greatly prevented rolling. Mr. Lukin's boat was strong and buoyant, but it was liable to be disabled by having the sides stayed in. This defect was obviated in Mr. Greathead's boat, which was invented soon after; its prevailing feature was that of being lined inside and outside with cork. His boat was instrumental in saving the lives of 300 persons in five years, near Tynemouth.

From time to time other inventors came forward with improvements and plans. Boats of various powers and dimensions were constructed, but some were found to fail in the moment of trial. In 1850 a prize of 100 guineas was offered for the best model of a life-boat. The committee appointed to adjudicate upon the merits of the designs sent in laid down the following among the requisite qualities:—A life-boat must be good in rowing, good in sailing, good in launching through a surf; it must have small internal capacity for water, and easy means of ridance of any it may receive; it must be buoyant, and possess self-righting power; it must be adapted for beaching, light for transport along the shore, roomy for passengers, and possess good access to stem or stern, &c. The model which was found to possess the greatest number of these good qualities was one sent in by the late Mr. James

Beeching, of Yarmouth, to whom the prize was consequently awarded. The officers of the National Life-boat Institution, however, afterwards designed a boat which comprised many of the features of the competitive boats, and added others suggested by their practical experience. This boat, gradually improved in later years, is the one which now constitutes the recognized English model, and is adopted by that highly useful institution. Many boats of the same kind have also been sent to foreign countries.

In the annexed cuts we give plans and sections, showing

the construction of the life-boats of the institution. The boats are usually 33 feet in length and 8 feet in breadth, but these dimensions have lately been increased to 45 feet length and 12½ feet breadth, retaining all their previous capabilities, while improvement in form has been made so as to afford greater facility for beaching. In fig. 1 the general exterior form of the boat is shown. The dotted lines indicate the position and dimensions of the air-chambers; the relieving tubes, with self-acting valves, for allowing the water which may enter to escape; and ballast.

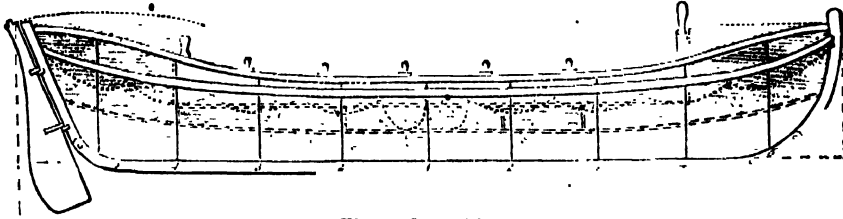


Fig. 1.—Sheer Plan.

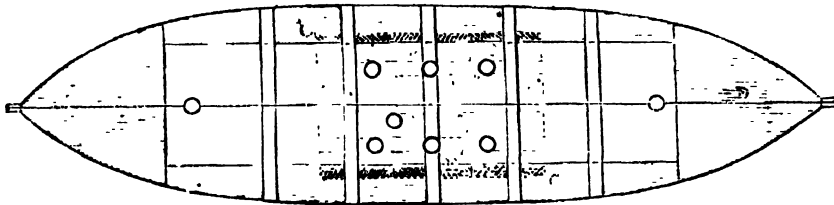


Fig. 2.—Deck Plan.

The festooned lines represent exterior life-lines attached round the entire length of the boat, to which persons in the water may cling till they can be got into the boat; the two central lines are festooned lower than the others, to be used as stirrups, so that a person in the water, by stepping on them, may climb into the boat without assistance. In fig. 2 A represents the deck, B the relieving tubes (6 inches in diameter), C the side air-cases, D the end air-chambers, E ballast, F scuttles to admit of a free current of air under the water-tight deck, G scuttle for air and to receive pump. In fig. 3 the exterior form of transverse sections, at different distances from stem to stern, is shown. Fig. 4 represents a midship transverse section, A being sections of the

over of a sea, or by a boat being suddenly thrown on her beam ends. This is accomplished by tubes fitted with self-acting valves, which open downwards only, so that they will allow any water shipped to pass out; whilst nothing beyond a trifling leakage can pass upwards through them. The greater the quantity of water within, the faster it will run out. (3) The power of self-righting which is accomplished chiefly by attaching an iron keel, weighing from 4 cwt. to 8 cwt. When the boat is upset, she is floated unsteadily on the two air chambers at the bow and stern, whilst the heavy iron keel and other ballast being then carried above the centre of gravity, an unstable equilibrium is at once effected, and the weight of the iron keel falling over on one side immediately restores the boat to her proper position.

Most of the life-boats in the United Kingdom now belong to, or are under the superintendence of, the National Life-boat Institution, a society which is well deserving of generous support. It was founded in 1824, and from that time to 1880 it had been the means of saving several hundred vessels and no less than 33,000 lives. It has now 268 boats stationed on those parts of the coast where experience has proved they will be most useful.

Each life-boat is regularly taken aloft for exercise, fully manned and equipped, so that the crew may be familiar with her qualities and proper management when the necessity for her services shall arise. The boat is kept on her carriage, in the boat-house, with all her gear in her ready for use, and signals are agreed upon for calling the life-boat's crew together in the shortest possible time.

The cost of a life-boat, with its carriage and boat-house, is £1000, and the average annual expense of maintaining a life-boat station is £70. The crews are formed by the fishermen and sailors on the coast, and are unflinching, brave, and unselfish in the hour of peril. In 1880 the institution expended £38,000 on its various life-boat establishments on the coasts of England, Scotland, and Ireland. For the services rendered in saving lives since

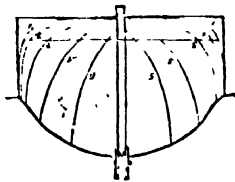


Fig. 3.—Body Plan.

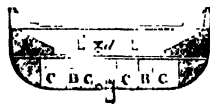


Fig. 4.—Midship Section.

side air-cases, H the relieving tubes, of the same depth as the space between the deck and the boat's floor; C, C, C, C, are spaces beneath the deck, placed longitudinally, at the midship part of the boat, with cases packed with cork, forming a portion of the ballast; d scuttle for ventilation, having a pump fixed in it, by which any leakage can be pumped out by one of the crew whilst afloat.

The chief peculiarities of the boats of the National Life-boat Institution are, (1) that they are rendered unsinkable, by attaching to them, chiefly within board, water-tight air-cases, or fixed water-tight compartments under the deck; (2) the capability of self-discharging in a few seconds any water which may be shipped by the breaking

its formation, 100 gold medals, 890 silver medals, and £60,000 in cash, have been paid in rewards. The institution also expended nearly £170,000 on its life-boat establishments from 1824 to 1881. Most large vessels now carry one or more life-boats. ("The Life-boat, History of its Work," by Richard Lewis, London, 1875).

A plan of the stowage of a life-boat is shown in Plate V. **BOAT-LOWERING GEAR.**

BOAT-BILL (*Canceroma cochlearia*) is a bird of the HERON tribe, remarkable for the form of its bill, which is very large and wide, and has the upper mandible deeply and broadly furrowed on each side from the base to the apex, leaving a strong rounded keel in the middle, terminated at the tip by a distinct hook. The boat-bill is a native of South America, frequenting the rivers and savannahs of Guiana and Brazil, where it perches on the trees that overhang the water, whence it precipitates itself on the fish which swim beneath. In the male, the forehead and upper parts of the neck and breast are dirty white. The back is rusty reddish; a long crest of black flowing feathers hangs from the head down the back of the neck. The female is destitute of a crest.

BOAT-BUILDING. Boats, from the canoe down to the torpedo-boat, are constructed of a great variety of materials—the solid log, burnt or hewn out; the wicker coracle, covered with hide; the kayak, bone and wood framed, and made buoyant by an almost entire covering of seal-skin; the canoe, of birch bark; the clinker built fishing boat; the carvel-built whaler, in which elm and larch are the prominent materials; the gig, the outrigger of the boat-racer, and the Rob Roy canoe, where mahogany or yellow pine is used; while for ship's service teak (wrought longitudinally or diagonally), iron (corrugated or plain surfaced), and steel (in either case galvanized), with more or less internal framing, each find favour in their various services. Halket's india rubber inflatable boat, intended to be used for carrying one or two men, has done much service; while the "Borthon" collapsible boat, cellular, of Canadian elm and canvas, has been navigated successfully from the Bay of Biscay to Plymouth. All boats whose buoyancy depends upon the use of textile materials, being also intended to fold up or change in form, are subject to a wear and tear not common to ordinary wood or metal boats, but they are considerably lighter in weight and more available for overlaid carriage or where stowage space is limited. The boats constructed of iron or steel are somewhat heavier than those built of wood, and while less liable to leak after continued exposure to heat, and although possessing more structural strength are less proof against damage through contact with sharp or rough obstacles. Stern-machines and torpedo-boats, such as are intended to develop very high speed (25 miles per hour), are built of galvanized steel, with either slight or partial metal or wood framing, and iron or wood keels, stems, and stern frames, the "hulls" and "chuffs" being made water-tight by paper or lead inserted between the surfaces, which are secured with rivets. Where wood frames are used with steel or iron "skins," they are attached thereto with "span-pieces" of the same metal at intervals, instead of fastening through the skin and frame, which would be liable to occasion leakage, and rapid decay of the "skin" or shells of the boats. The chief cause of accident when the boats are resorted to for speedily leaving a vessel, is the previous neglect of practice and discipline for this momentous duty amongst the crews of merchant vessels, especially in steamers. The shortness of the voyage, and the consequent continual changes among the officers and crews, not very much against any system of exercise which should otherwise prepare them for this emergency, and prevent to a great extent the terror and the often fatal results which occur, especially through accidents to passenger vessels. The neglect of the boat's equipment, of course, also occurs further

calamity. When there is a great height of the ship's side above the water, the rolling motion of the vessel while a boat is in process of lowering has often, through its striking the side, caused such damage to the boat as to render it useless. This difficulty was very apparent in the *Great Eastern* while she was engaged in laying the Atlantic telegraph cable.

All sea-going passenger steamers are required to carry certain kinds of life-boats which are fitted with air-tight cases; other boats, which have buoyancy supplied by cork inclosed in canvas, are used by merchant vessels, either steam or sailing. Boats of wood or metal, fitted with steam screw propellers, are also carried by the larger type of passenger, transport, and yacht steamers.

BOATING. See ROWING.

BOAT-LOWERING. The ordinary service-fitting on board her Majesty's ships for hoisting and lowering boats consists of a simple tackle carried outside the ship, with a thimble attached to the lower block and a hoop in the slings. It is worked by the crew remaining in the ship, and is, upon the whole, very fairly efficient; but it is admitted that the blocks and other separate portions of the apparatus are capable of improvement. It is objected, moreover, that the two falls acting independently of one another, one end of a boat may descend much faster than the other; that the necessity of separately unhooking by hand each fall after the water is reached is a serious defect, which may lead to disaster; and that a simple machine by which the boat's crew could lower themselves and disengage the boat when they found themselves close to the water would obviate the risk of being swamped before the ship's side was left. It will be remembered that in 1852, when the royal mail steamer *Dunoon* was destroyed by fire, many lives were lost in the attempts made to lower boats while the ship was going at a high speed, and that public attention was directed to the importance of disengaging gear to avoid or decrease the risk of so lowering boats. Many ingenious contrivances have been designed to meet the want, amongst others that of Mr. Clifford (see fig. 1 of the accompanying Plates), Capt. Kynaston (fig. 2), Hill & Clark (fig. 3), Carpenter (fig. 4), Leeman (fig. 5), Sample & Ward (fig. 6), Douglas (fig. 7), and Robinson (fig. 8). Of the foregoing plans figs. 1, 3, and 6 can be disengaged only when water-borne, while figs. 2, 4, 5, 7, and 8 are under the control of the coxswain or person in charge, and can be disengaged at any time; the vital object being in each of the eight arrangements to have the boats detached at both ends at the same time, so as to avoid the greatest risk to which boat-lowering in a seaway is liable.

Several of the above inventions are patronized by the Admiralty to the extent that any captain who so desires may be supplied with them for part of the outfit of boats, but the use of them is not made compulsory.

In the early part of 1873 a sad catastrophe occurred in the Bay of Biscay on board H.M.S. *Arcturion*, when a boat lowered to save life was swamped, and her crew were drowned. It was then alleged by many that the loss was due to the objection of the service and the Admiralty to the use of life-boats and of the inventions already mentioned. The committee referred to in the article BOAT was then appointed, and after a very searching inquiry they unanimously reported the ordinary service plan to be the most satisfactory mode extant of lowering boats at sea. It possesses the indispensable advantages of simplicity, enjoys the entire confidence of most experienced officers, and no evidence could be brought to attribute the loss of a single life in her Majesty's service to this fitting. The general objections to other inventions were their more complicated arrangements, and their unsuitability to the variations of climate to which ships of war are subject.

BOATSWAIN, in a ship of war, is a warrant officer who has the care of the rigging, cordage, anchor, sails,

boats, flags, and other stores, which are committed to his charge. One of the chief duties which devolve upon this officer is to inspect the rigging of the vessel every morning; to see that all things are in good condition, to remove whatever may be judged unfit for service, and to supply whatever may be deficient. He cannot, however, cut up or otherwise appropriate any cordage or canvas for the public uses of the ship without a written order from the captain, and under the inspection of the master; and at the end of a voyage must present to the surveyor of the navy minute accounts, previously audited and vouched by the captain and master, of the purposes to which all the stores in his department have been applied. The more exclusive function of the boatswain is that superintendence and control which he exercises over the men. He summons the crew to their duty, assists with his mates in the necessary business of the ship, and relieves the watch when its time expires. His calls on the crew are made by a silver whistle of a peculiar construction, well known as the "boatswain's whistle," and he is a sort of provost-marshal in the ship. In bad weather it is his duty to look well to the boats and anchors. The word is pronounced *bo'sun*.

BOB'IN, a small cylindrical wooden pin bored through the centre, fitted with flanged edges, and used for winding thread. The commonest form is that which is used for sewing cotton, and which is too familiar to need description. These are made of birch or other hard wood by means of ingenious automatic machines, which turn out from 10,000 to 11,000 as the result of a day's working. In weaving, bobbins of a different shape are used, having a flange only at the upper end, and varying in size according to the fineness of the material to be woven. In the process of spinning enormous numbers of bobbins are used, and large manufactories, employing hundreds of hands, are devoted to their production. For this purpose they are made with deep flanges and in a variety of sizes, the longest being required for the "slubbings" and the smallest for the spun yarn.

BOB-O-LINK or **BOB-LINK** (*Dolichonyx oryzivorus*) is a popular name for the rice-bird or rice-bunting of America. It belongs to the family of STURNIDÆ.

This is a well-known bird throughout the whole of North America, from the Saskatchewan river to Mexico and the



The Bob-o-link.

West India Islands. It is a bird of passage, and winters in the West Indies and Mexico, commencing its spring return to the more northern latitudes in March; the flocks in their progress scatter themselves over savannahs and meadows, feeding on insects and their larvæ as well as on the tender wheat and early barley. The males utter a

rapid voluble strain in chorus, all simultaneously ceasing at the same instant. The flocks make their spring migration chiefly by nocturnal journeys, but by diurnal journeys in autumn. About the middle of May these birds reach the state of New York, and begin to pair and to prepare their nests. At this season the males pour forth their songs in the air, rising and falling in successive jerks. The nest is placed amongst the grass, or in a field of wheat or barley on the ground, and is composed of dry grasses or leaves, lined with finer materials. The eggs, five in number, are of a dull bluish white, spotted with blackish brown.

In July, when the young are reared, the rice-birds assemble in incredible multitudes and begin their devastations. They plunder the fields of grain; they swarm about seed-beds, alighting in thousands, and bending down the stems with their weight, while feeding on the ripe seeds. Their progress is towards the southern states, and in September they appear in Carolina in countless numbers, spreading over the rice-fields, and devouring the grain while yet soft and milky. Thus they often ruin acres of this produce. From the time of their congregating, in July to September, the gun thins their ranks; thousands are killed for the markets, their flesh being excellent. In October, before the rice crop is gathered in, the rice-birds have made their appearance in Cuba and Jamaica, where they become so fat as to deserve the name of butter-birds, and are in high esteem for the table.

The bob-o-link is $7\frac{1}{2}$ inches in length, and the male is of a black colour, with the back of the head orange-colour, and the lower part of the back, the rump, and scapulars white. The female is brownish yellow, streaked with brownish black on the back; and the male assumes a similar dress when the breeding season is over. The feathers of the tail are sharp at the end.

BOCAGE, LE, a district in Normandy, between the rivers Vire and Orne, of which the town of Vire was the capital; it now forms part of the department of CALVADOS. The men and animals of the district are remarkable for their small size. There is another district called Le Bocage in LA VENDEE.

BOCCA, the Italian word for "mouth," is used by the Italians either in the singular or in the plural (*bocche*) to designate the mouths of rivers, as "Bocca d'Arno," the mouth of the Arno, or the narrow straits leading into a bay, as "Bocche di Cattaro," the entrance into the Bay of Cattaro in Albania. The narrow pass in the Apennines, on the old road from Piedmont to Genoa, is called "La Bocchetta," the little mouth. "Bocca Tigris" is the name given to the entrance of the river Canton in China. The Spaniards use the word "Boca" in the same way.

BOCCACCIO, GIOVANNI, the famous Italian romancer, was born at Paris in 1313. He was the illegitimate son of a merchant of Florence by a French mother. In his boyhood he spent six years at Paris. On his return to Florence, having expressed a dislike of mercantile pursuits, his father sent him to study the canon law. After some years passed in this study he was sent to Naples, where he learned elegant literature, and ended by falling in love with a natural daughter of King Robert. Boccaccio's attachment was returned; and to please his mistress he wrote "Il Filocopo," and "Le Teseide," a poem in ottava rima on the fabulous adventures of Theseus, the first romantic and chivalrous poem in Italian. Chaucer borrowed from the "Teseide" his "Knight's Tale," afterwards modernized by Dryden under the name of "Palmerin and Anise."

In 1342 Boccaccio was recalled home by his father, but in 1344 he returned to Naples, where he remained several years. He there wrote the "Amorosa Fiammetta," "Il Filostrato," a poem in ottava rima, and "L'Amorosa Visione," a poem in terza rima. At this time he frequented the court of Queen Joanna, who had succeeded her father

Robert. At her desire he wrote his "Decamerone," a hundred tales, ten of which are supposed to be told every afternoon of ten successive days by a society of seven young women and three young men, who, having fled from the plague which visited Florence in 1348, had retired to a country-house some distance from the town. The flight was an actual fact, and the villa is still shown on the road to Fiesole. Most of the stories turn upon love intrigues; they are full of humour, and admirably told, but the details are often very licentious. Some of the tales, however, are unexceptionable, and are even moral. Several of Boccaccio's tales have been used by English poets, such as Shakspeare's "All's Well that Ends Well." Chaucer's famous tale of "Griselda" comes from the "Decamerone," and in our own day Alfred Tennyson has dramatized "The Falcon," one of the most pathetic love tales ever told. In fact, as Hazlitt has the merit of being the first to point out, the charge of exceptional coarseness, beyond that due to the custom of the age, was levelled against Boccaccio by the monks, who smarted under the lash of his satire. The truth is that though unhappily not a man of pure mind, he is one of the most critically tasteful and refined writers. As a rule, those who condemn Boccaccio have never read a line of his writing, while great and noble minds (as in the instances given above) find their study of these supposed indecencies result in the production of chaste and virtuous poetry. Surely this is a wondrous alchemy. About the year 1360 he returned to Florence, where, by the death of his father, he had become possessed of his inheritance, which he spent in travelling and in purchasing MSS., chiefly of the Greek and Latin classics.

Boccaccio's merits being now known and appreciated by his countrymen, he was employed by the state of Florence in several offices and missions. In 1355 he wrote "Il Corbaccio," a broad satire against women. In 1360 he induced the Florentines to found a chair of Greek literature in their university, held the professor in his own house, and studied Greek no less for him.

In 1361 a change took place in Boccaccio's moral conduct, in consequence of a communication sent to him by a Carthusian monk when on his death bed, and he had some thoughts of entering a Carthusian convent. He wrote to Petrarch on the subject, and by him was induced to change his intention. His studies took a more serious turn, and he devoted much time to the Scriptures. In 1363 he spent three months at Venice with Petrarch. After his return to Florence he was sent by the republic on a mission to Pope Urban V., then at Avignon, and again to the same pope at Rome in 1367. In 1373 he was appointed to lecture at Florence on Dante's "Commedia." He wrote a brilliant commentary on the "Inferno," and also a life of Dante, but this is not very accurate. In 1374 he retired to his paternal house at Certaldo, where he made his will, leaving his library to the convent of Santo Spirito at Florence for the use of the students. A fire which occurred in the convent a century afterwards destroyed this valuable collection, the work of Boccaccio's whole life. He died 21st December, 1375, at Certaldo, where he was buried.

Boccaccio may be considered as the father of Italian prose. His "Decamerone" is the earliest prose work written in pure Italian. The language is so exquisite that the most earnest efforts to suppress the "Decamerone" (in the interests of morality) have always failed utterly. It remains the test and touchstone of the superb Florentine tongue. Also, as we have said, due allowance being made for the time, it is not a purposely gross book, and it has far more refined beauties than repulsive licentiousness. Boccaccio and Petrarch were the revivers of classical literature in Italy. They spared neither labour nor money in recovering the Greek and Latin classics, and in giving an impulse to the study of them. Boccaccio wrote several works in Latin. His Italian works have been published together, carefully

corrected from the best existing MSS., in seventeen vols. 8vo (Florence, 1827-34).

(Baldelli, "Vita di Giovanni Boccaccio," Florence; Mazzuchelli, "Scrittori d'Italia.")

BOCCHERINI, LUIGI, a musical composer so gifted as to be not an unworthy rival to Haydn (his contemporary) in chamber instrumental music. He was born at Lucca in 1740, and, like so many great composers, was the son of an able practical musician. He showed such talent as a boy that he was sent to Rome, whence, at the age of twenty-eight, he set out on a brilliant tour, ending in a most flattering reception at Paris, where the publishers contended for the productions of his pen. He was invited to Madrid by the Spanish court, and the king's brother was his warm patron in that city. In 1785 his genius was retained exclusively for the glory and pleasure of Frederick William II., king of Prussia, till the death of that king in 1797. This long absence from the public ear left him in some difficulty, and he had to create a fresh reputation. After some struggles, Lucien Bonaparte, the wayward talented brother of Napoleon, found him out, and fortunately appreciated his merit. Unhappily, Lucien's erratic career took him away from Boccherini, and the composer became very poor; so that he welcomed death as a release when it freed him from trouble in 1805. His works seem to have taken a new lease of public favour. The very fine sonatas for the violoncello have been admirably arranged by Piat, and are some of the most favourite pieces for concert performances on that instrument. His style is not vigorous, but very delicate and refined, full of original and melodious phrasing, and very grateful to the player. Considerably over 300 works of Boccherini's are published, and more remain unprinted.

BOCKH, AUGUSTUS, one of the greatest of modern philologists and antiquaries, was born at Carlsruhe 21th November, 1785. He was educated at Halle, where he studied under Wolf, by whose influence he was directed to the study of philology. In 1807 he was appointed professor extraordinary, and in 1809 ordinary professor at the University of Heidelberg. In 1811 he was transferred to Berlin, being appointed to the chair of rhetoric and ancient literature, a position which he maintained with ever-increasing fame and honour for upwards of half a century. The several branches of antiquarian lore which formerly laid claim to the name of philology were by him united into one organic structure. According to his view of the matter, philology is the systematic knowledge of everything that has been known; the learned revival of a nation's life in all its bearings upon public and domestic affairs, upon history and politics, upon religion and literature, science and the arts. He has given ample proof of the importance of this theory in his lectures and various works. Of the latter the chief are—1. His edition of the works of Pindar (two vols. Leipzig, 1811-22), in which he not only corrected the text of this author, but at the same time laid down a new theory of ancient versification. 2. "The Political Economy of the Athenians," a work of vast erudition and admirable critical acumen. This was published in 1817 (two vols. Berlin), and was translated into English by Sir George Cornwall Lewis (London, 1828; second edition, revised, London, 1842). 3. "Investigations concerning the Weights, Coins, and Measures of Antiquity" (Berlin, 1838). 4. "Records of the Maritime Affairs of Attica" (Berlin, 1840). 5. The commencement of a collection of every Greek inscription known in print or manuscript (Berlin, 1824-62). This has since been continued first by Franz and afterwards by Kirchhoff. His lesser productions, which are very numerous, are all distinguished by profound learning and keen insight into the life and thought of classical times. He died in 1867. His minor writings have been collected and published (five vols. Berlin, 1858-71).

BOC-LAND, land held by book or charter. The two great distinctions of lands in the Anglo-Saxon times were

those of boc-land and fole-land. The former means land which had been severed from the fole-land, and converted into an estate of perpetual inheritance. Fole-land was the property of the community.

Mr. Allen, in his "Inquiry into the Rise and Growth of the Royal Prerogative in England," says that boc-land might belong to the church, to the king, or to a subject. It might be alienable and devisable at the will of the proprietor. It might be limited in its descent, without any power of alienation in the possessor. It was often granted for a single life or for more lives than one, with remainder in perpetuity to the church. It was forfeited, for various delinquencies, to the state. Boc-land, moreover, was released from all services to the public, except those which were comprised in the phrase "*trinoda necessitas*," which were said to be incumbent on all persons: these were the contributing to military expeditions, and to the reparation of castles and bridges. Boc-land also might be held by free-men of all ranks and degrees. A eorl might possess boc-land and perform for it military service to the state. If he had five hides of boc-land with the other requisites demanded by law, he was entitled to the privileges of a thegn. (Wilkins' "Leg. Anglo-Sax." pp. 70, 71.)

When boc-land was created the proprietor, unless fettered by the original grant, or by a subsequent settlement of the estate, appears to have had an unlimited power to dispose of it as he chose (Somner's "*Gavelkind*," pp. 88, 89). He might transfer it by grant or bequeath it by will, in such quantities, for such periods, and on such conditions as he was pleased to appoint. If conveyed by a written instrument, whatever might be the stipulations annexed to the grant, the land was still denominated boc-land. (Houing's "Chartul," pp. 129, 140, 141, 180, 182, 195, 206. Smith's "Bede," pp. 769, 771.)

BODE'S LAW. This is a most curious approximation to the law so eagerly sought for after Kepler's discoveries, to connect in some order the relative distances of the planets from the sun. Bode in 1778 published a solution, of which he had found the idea in a note added by Professor Titius of Wittenberg to a German translation made by him of Bonnet's "*Contemplation de la Nature*" in 1772. Taking the numbers—

0, 3, 6, 12, 24, 48, 96, 192, 384,

each of which (except the second) is double of its predecessor, and adding the number 1 to each, we obtain the series—

4, 7, 10, 16, 28, 52, 100, 196, 388.

These numbers represent with remarkable nearness the relative distances of the planets Mercury, Venus, the Earth, Mars, ———, Jupiter, Saturn, Uranus, and Neptune from the sun, the true distances being in the following proportions:—

3·87, 7·23, 10·00, 15·23, ———, 52·03, 95·39,
191·82, 380·37.

Here we see that the fifth number in Bode's law has no representative. But when Uranus was discovered by Herschel in 1781, accidentally, and was found to fit in with the eighth term of the series (which, of course, Bode had only extended to seven terms, as he only knew seven planets), then an organized search was made for the "missing planet" by a society of astronomers, who paraded out the zodiac amongst themselves. Their search was rewarded by the discovery of Ceres in 1801, and a large number of **ASTEROIDS** have been added to the zone in which Ceres moves by successive discoverers, as is mentioned in the article on these curious planetary bodies. The average distance of the principal asteroids from the sun is very close to the 280 in the proportion of Bode.

No explanation of this singular connection has yet been

offered; even Neptune, which should by this law be at the relative distance 388, and is actually considered to be at the relative distance of 300·37 only, can hardly yet be said to break the law, for its true distance is by no means well established.

BODLE, a copper coin formerly current in Scotland of the value of two pennies Scots, or the sixth part of an English penny. It is said to have been so called from a corruption of the name *Bothgall*, a master of the mint.

BODLEIAN LIBRARY, the public library of the University of Oxford, founded by SIR THOMAS BODLEY. In 1597 Sir Thomas Bodley sent a letter to the vice-chancellor, Dr. Ravis, dean of Christ Church, offering to restore the building which then contained the public library, and to settle a fund for the purchase of books and the maintenance of proper officers. This offer being accepted, he commenced his undertaking by presenting a large collection of books purchased on the Continent, and valued at £10,000. Other collections and contributions were sent in from various noblemen, clergymen, and others, to such an amount that the old building was no longer sufficient to contain them. He then proposed to enlarge the building, and the first stone of the new foundation was laid 17th July, 1610. By his own liberality, and the benefactions of many eminent persons, the university was enabled to add three other sides, forming the quadrangle and rooms for the schools, &c. Sir Thomas did not, however, live to see the whole completed.

The Bodleian Library was first opened on the 8th of November, 1608, and by the charter obtained of King James, Sir Thomas, then lately knighted by him, was declared founder. Since 1780 a fund of more than £400 a year has been established for the purchase of books. This arises from a small addition to the matriculation fees, and a moderate contribution annually from such members of the university as are admitted to the use of the library, or on their taking their first degrees, to which is to be added the privilege under the Copyright Act of having a copy of every book printed in Great Britain and Ireland.

The library is under the control of a board of curators, consisting of the vice-chancellor, the two rectors, the five regius professors of divinity, civil law, medicine, Hebrew, and Greek, and five members of the congregation of the university elected for ten years by that house.

The administration of the library is committed to the care of a librarian elected by convocation, with an annual stipend of £1000. He is assisted by two under-librarians, whom he nominates himself, subject to the approval of the curators and of convocation, and who receive a yearly stipend of £400 each. Several assistants are appointed by the librarian, subject to the approval of the curators.

All members of the university who have taken a degree are admitted to study in the library; no books have ever been suffered to be taken from it. Literary persons, either native or foreign, are also allowed, on being duly recommended, to read and take extracts from the books in this collection.

The Bodleian Library is now one of the greatest treasures not merely of England but of the world; it ranks only second to such vast national collections as those of the British Museum or of the National Library in Paris. Magnificent donations for nearly three centuries have enriched it with the rarest Oriental, Greek, Latin, and Hebrew books and MSS. It contains about 300,000 volumes, and receives at the rate of 5000 volumes a year.

The picture gallery, which is an appendage to the library, contains portraits of many eminent persons who have been benefactors or members of the university, models of many edifices both ancient and modern, and many other objects of interest.

The building known as the "Radcliffe Library," is used as a reading-room in connection with the Bodleian

Library, and is open from 10 a.m. till 10 p.m. on every day on which the library itself is open. It contains on its own shelves and tables all the newest works, and is available for the use of other books, whether printed or manuscript. In the gallery is deposited the Hoope collection of engraved portraits. ("The Bodleian Library, from 1098 to 1867," by Rev. W. D. Macray, London, 1868.)

BODLEY, SIR THOMAS, from whom the Bodleian or public library at Oxford takes its name, was the eldest son of Mr. John Bodley of Exeter, by Joan, daughter and heiress of Robert Home, Esq., of Ottery St. Mary. He was born at Exeter, 2nd March, 1514. During the persecutions under Mary his father lived with his family in exile at Geneva, where the young Bodley commenced his studies. Upon the accession of Queen Elizabeth in 1558 he returned to England with his father and family, who settled in London, and was soon after sent to Magdalen College, Oxford. In 1563 he took the degree of B.A., was chosen probationer of Merton College the same year, and the year following was admitted fellow. In 1566 he took the degree of M.A., and in the same year read natural philosophy in the public schools. In 1569 he was elected one of the proctors of the university, and after that for a considerable time supplied the place of university orator. In 1583 he was made gentleman usher to Queen Elizabeth, and shortly after was employed by the queen in several diplomatic missions, in which he behaved greatly to the satisfaction of his royal mistress and the advancement of the public service. He obtained his recall in 1597, and the same year he set about the noble work of restoring, or rather founding anew, the public library at Oxford, on which he expended large sums of money, and to which he afterwards bequeathed a valuable estate. (See the preceding article, **BODLEIAN LIBRARY**.) After King James' accession to the throne Sir Thomas Bodley received the honour of knighthood. He died on the 28th of January, 1612, and was buried with great solemnity at the upper end of Merton College choir. Sir Thomas Bodley wrote his own life to the year 1609, which, together with the first draught of his statutes for his library, and a collection of his letters, was published from the originals in the Bodleian Library by Thomas Heame under the title of "*Reliquiæ Bodleianæ*, or some genuine Remains of Sir Thomas Bodley" (8vo, London, 1703). The life alone had been previously published in 4to (Oxford, 1617).

BODMIN, a market-town, parliamentary borough, and the county town, is situated in the central part of Cornwall, 274 miles W.S.W. from London by the Great Western Railway. It is a very ancient place, and contained a monastery of Austin canons, which was dissolved in the reign of Henry VIII. The town is situated partly in a valley and partly on the side of a hill, and consists principally of a single street about a mile long. The church, which was rebuilt about 1170, is a fine old structure, with a tower, a remarkable front, and a curious sculptured tomb of Thomas Vivian, the last prior. There is a town hall, a county gaol, a county lunatic asylum, a union workhouse, a grammar-school founded by Queen Elizabeth, and chapels for various denominations of dissenters. On Beacon Hill, close by, is a memorial column 144 feet high, to General Sir W. R. Gilbert, of Indian fame. The town contains some manufactures of boots, shoes, and serge. The parliamentary borough, which includes part of four other parishes, had a population of 6866 in 1881. It formerly returned two members, but was deprived of one by the Reform Act of 1867. The number of electors in 1883 was 890.

BO'ECE or BOETIUS, HECTOR, the Scottish historian, was of the family of Boece of Balbride or Panbride, in the shire of Angus (now Forfarshire). He was born about the year 1465-66, in the town of Dundee, whence he had the appellation of Deidmanus, as he is styled in the

edition of his history published by Ferrarius. It appears that he received his grammar education first in his native town, and then at Aberdeen, whence he went to Natogue College in the University of Paris, where he proceeded A.M. in the year 1491, and in 1497 was appointed professor of philosophy.

In the beginning of the sixteenth century, Boece was invited home by Bishop Elphinstone, of Aberdeen, to be principal of the college about to be erected in that city, when he was induced to accept the invitation by means, as himself says, of "gifts and promises."

In the beginning of 1522 Boece published at Paris his "*Vitæ Episcoporum Morthlensium et Aberdonensium*," a work to which he was, it seems, led by the exemplary life of the late bishop, an account of whom, indeed, occupies the greater part of it. The dedication, which is to Bishop Dunbar, is dated from the College of Aberdeen, prid. Cal. Sept. 1521. In 1526 the first edition of Boece's "*History of Scotland*" was published—a good work for the time, but the value of which is somewhat diminished by the author's love of the marvellous. In 1527 the king gave him a pension of £50 Scots yearly, to be paid by the sheriff of Aberdeen out of the royal casualties. About 1531 the king was enabled to advance Boece to a benefice, and the learned principal then obtained the rectory of Fyvie, in the shire of Aberdeen, which he held at his death in 1536. The same year (1536) Bellenden's translation of Boece's History was published at Edinburgh. This translation was made at the command of King James V., whose limited education precluded him from perusing the Latin original. Bellenden's translation of Boece was a free translation, the author having added and altered as he thought proper; and it again was put from the Scottish dialect, in which it was written, into English. Boece died in 1536, and was buried in the chapel of the college near to the tomb of Bishop Elphinstone. In the front of the chapel is his coat of arms, with "H. B. ob. 1536."

BOEHMERIA, a genus of plants belonging to the order *URTICACEÆ*, and to that particular division, *Urticeæ*, to which the nettles belong. There are forty-five species, natives of the tropical regions of both worlds, extending also into subtropical parts in Chili, North America, and Japan.

The unisexual flowers are collected into heads with no involucre; the stigma is filiform and persistent; the fruit-bearing perianth is membranous or dry, and incloses a free achene; the hairs on the plant do not sting. *Boehmeria nivea* yields the fibre with which the grass-cloth of China is made. See **GRASS**, **CHINA**.

BÆOTIA was the ancient name of that part of Livadia which was bounded on the west by Phocis, on the north and east by the Opuntian Locrians and the Eubœan Sea, and on the south by Attica and the Corinthian Gulf. This country consists of two basins of irregular form and of unequal dimensions, the valley of the Asopus, and the lower part of the vale of the Cephissus. The valley of the Asopus is bounded on the south by the range of Parnes and Cithæron, and contained the towns Thebes, Tanagra, Thespie, Plataeæ, and Asera. The northern division included the Lake Copais, and the towns Orchomenus, Charonea, Coronea, Lebadea, and Haliartus. In ancient times the two valleys were under the separate dominion of the two towns which in each of them were most distinguished by wealth and population. In the northern Orchomenus for a long time took the lead, and the city on the Ismenus, under the different names of Cadmea and Thebes, was always the ruling power in the southern portion.

In fact Bæotia is almost surrounded by mountains, for besides Parnes and Cithæron, which have been mentioned as bounding it on the south, Helicon and Parnassus inclose it on the west, the east coast is fringed by a continuous and lofty chain, and the Opuntian Mountains present a firm barrier to the north.

The area of Bœotia is about 1080 square miles, and its population was, in the time of Thucydides and Xenophon, about 130,500. Some of the principal productions and manufactures of the country are enumerated in the "Achæniæns," one of the comedies of Aristophanes. The linen fabrics of Bœotia were held in great estimation, and the iron-mines which were worked in the eastern chain of mountains supplied the material for the famed Bœotian cutlery. The soil of these inclosed valleys was very rich, and the atmosphere damp and thick; the two causes may have worked together to bring about that famous "Bœotian dullness" which affords so much merriment to Greek writers, and has passed into a proverb for all time. Yet we must remember that Hesiod was born at Asara, Pindar at Cynoscephalæ, and Plutarch at Chaeronea.

The early history of the inhabitants of Bœotia partakes of the obscurity of the early history of all the Grecian communities. The Cadmeans and the cognate tribe of the Minyans occupied the land till about sixty years after the taking of Troy, when they were driven out by the Æolian Bœotians, a Thessalian people, settled in the upper vale of the Apidanus, who gave the name Bœotia to their new home. The Bœotians themselves were forced to leave by the Thessalian immigration from Thesprotia.

We know from Æschines that the Bœotians were members of the Amphictyonic assembly, and we are informed by various authors that the Bœotian towns soon formed a league, of which the Theban state was the head. The deputies of the confederate states met in the plain before Coroneia. Every one of the confederate states was, as such, free, but several of them had smaller towns dependent upon them. It is probable that there were originally fourteen of these states; but the number at the time of the battle of Delium (B.C. 424) was apparently eleven. The affairs of the confederacy were debated at four national councils, the Bœotarchs or representatives of the confederate towns having the initiative authority, and the members of the council the power of confirmation. (Thucydides, v. 38.) The Bœotian confederacy was dissolved in B.C. 171, after having undergone many changes.

With regard to the form of government which prevailed in the several Bœotian towns, it is probable that it was the same with that of Thebes, which was in the historical times generally a rigid oligarchy. This will explain why the Bœotians were opposed to the neighbouring democratic state of Attica. About 507 B.C. they joined the Peloponnesians and Chalcidians in an attack upon the Athenians (Herod. v. 74, &c.), and, almost alone amongst the Greeks, they went over to the Persians in the invasion of Xerxes (480 B.C.) In the year 455 B.C. the decisive battle of Enophyta subjected all Bœotia to the Athenians, and Thebes became democratical; but a few years after (147 B.C.) the oligarchical form of government was restored, and the signal defeat sustained by the Athenians at Coroneia freed Bœotia from her foreign yoke. The Thebans were active partisans of Sparta in the Peloponnesian War, and contributed mainly to the downfall of Athens. In 382 B.C. occurred the treacherous seizure of the Cadmea, or citadel of Thebes, by Phœbidas the Lacedæmonian. Its subsequent recovery by Pelopidas brought about another war between Bœotia and Lacedæmon, in which the great abilities of the Theban generals, Epaminondas and Pelopidas, made Bœotia the leading power in Greece. But Epaminondas fell at Mantinea, and the power of Thebes fell with him. The Macedonian influence now began to prevail. Athens and Thebes were overthrown by Philip at Chæronea (338 B.C.), and three years afterwards Thebes was destroyed by Alexander the Great. In the year 315 B.C. Cassander rebuilt Thebes, with the co-operation of the Athenians, but it never regained its political importance. Thebes favoured the Roman cause in the war with Persæus, but it sank into insignificance.

BO'ERS (Ger. *bauern*, agriculturists, farmers), the Dutch agricultural colonists of the Cape of Good Hope. They are principally engaged in the keeping of sheep and cattle, of which some of them possess immense numbers. They have the reputation of being sober, industrious, and hospitable, but at the same time somewhat ignorant and narrow-minded, and possessed of a strong determination to walk only in the ways of their fathers. See *TRANSVAAL*.

BOETHIUS, ANICIUS MANLIUS TORQUATUS SEVERINUS, a distinguished Roman statesman and author, was born at Rome A.D. 455, forty-six years after the taking of that city by Alaric. His father was put to death by Valentinian III., to whom he had been prefect of the palace, in the very year in which his son was born. His relations gave Boethius a good education, and encouraged in him an early taste for philosophy and letters. They sent him to Athens, where he remained for eighteen years.

Boethius was made consul soon after his return to Italy, in the year 487. Odoacer, king of the Heruli, at that time reigned in Italy. Two years afterwards Theodoric, king of the Goths, invaded the country, put Odoacer to death, and fixed the seat of his government at Ravenna. The Romans, and the inhabitants of Italy generally, soon became reconciled to the administration of Theodoric. In the eighteenth year of Theodoric, Boethius was advanced a second time to the dignity of consul, after two of his sons had received the same honour.

He became a voluminous author, translated and annotated Aristotle, Plato, &c., edited Cicero and Porphyry, wrote learnedly on geometry himself, and translated Ptolemy and Archimedes. The only work now read (besides the "Consolation") is the well-known treatise on music, until comparatively recently the recognized authority on ancient music. It is a *resumé* of Ptolemy's work by one who himself only knew music from its arithmetical or mathematical side; and in consequence this treatise has done considerable damage, unwittingly, by putting students on false tracks. The faulty system of music of the dark ages was in greater part due to this treatise of Boethius, unchecked by any knowledge of the Greek originals.

In the year 522 he was a third time elected consul. It was during this consulship that he fell under the displeasure of Theodoric. Theodoric was an Arian, and Boethius, who was a Catholic, published about this time a book upon the unity of the Trinity, which enabled his enemies at court to accuse him of desiring not only to destroy Arianism, but to effect a change of government, and deliver Italy from the dominion of the Goths. For this supposed crime he was, unheard and undefended, at the distance of 500 miles, prescribed and condemned to death. Theodoric did not at this time carry his sentence fully into execution, but contented himself with confiscating his effects, banishing him to Pavia, and there confining him to prison. Boethius wrote during his confinement, in five books, his treatise on the "Consolation of Philosophy," the work upon which his fame chiefly rests. He had scarcely concluded this work when Theodoric ordered him to be beheaded. His execution took place in prison, 23rd October, 526.

There are few who do not know the noble verses which Dr. Johnson translated from the "Consolation," with the rare merit of perhaps surpassing his original. The passage ends—

"To cernere finis
Principium, vector, dux, semita, terminus idem."

The corresponding lines to these in Dr. Johnson's version are subjoined. The passage is often used as a hymn.

"From thee, great God, we spring; to thee we tend,
Path, motive, guide, original, and end."

The "De Consolatione Philosophiæ" is partly in prose and partly in verse; it was translated into Saxon by King Alfred, and illustrated with a commentary by Asser,

bishop of St. David's. King Alfred's translation into Saxon was published at Oxford in 8vo, 1698, by Christopher Rawlinson, and again with an English version from it by J. S. Cardal (8vo, Lond. 1829). There are also other English versions, notably one by Chaucer.

A translation into French by Jean de Meun was printed at Paris by Verard in 1494. The best edition of Boethius' whole works is that printed in two vols. folio, at Basel in 1570. An 8vo edition was published at Jent in 1823 by Othmar.

BOG. The name of bog has been given indiscriminately to very different kinds of substances. In all cases the expression signifies an earthy substance, wanting in firmness or consistency. In some cases, where springs of water, or the drainage from an extensive area, are pent up near the surface of the soil, they simply render it soft or boggy, and in this state the land is perhaps more properly called a quagmire. A second state of bog is where, in addition to the condition just described, a formation of vegetable matter is induced, which, dying and being reproduced on the surface, assumes the state of a spongy mass of sufficient consistence to bear a considerable weight. Bogs of this description are numerous and extensive in Ireland, where they are valuable, from the use made of the solid vegetable matter both as fuel and as a principal ingredient in composts for manures. Where the turf has been cut away for these purposes several bogs have been reclaimed by draining, and the subsoil is then readily brought into cultivation. Bogs also occur in Cornwall and other parts of Great Britain, where the form of the surface and the nature of the earth favour the general condition under which bog is formed. Although peat-moss always springs from some moist spot, it will grow and spread over sound ground, and if not stopped by some natural or artificial impediment, such as a wall, would overrun whole districts. In this case it absorbs any moisture which reaches it, and retains it like a sponge. The depth of a bog depends on the level of the surrounding grounds, as by this is determined the power of letting off the water which saturates it. See DRAINING.

The bogs of Ireland are estimated on the whole to exceed in extent 2,500,000 English acres. The greater part of these bogs may be considered as forming one connected mass. If two lines were drawn from Wicklow to Galway and from Howth to Sligo the space included between these lines, which would occupy about one-fourth part of the entire supposed extent of Ireland, would contain about six-sevenths of the bogs in the island, exclusive of mere mountain bogs and bogs of no greater extent than 800 English acres. This great division is traversed by the river Shannon from north to south, which then divides the great system of bogs into two parts. The smaller bogs, excluded from the foregoing computation, are very numerous. In the single county of Cavan there are above ninety bogs, not one of which exceeds 800 English acres, but which collectively contain about 17,000 English acres, without taking into account any bogs, the extent of which is from 5 acres to 20 acres each. Most of the bogs which lie to the eastward of the Shannon, and which occupy a considerable portion of the King's County, and the county of Kildare, are generally known by the name of the Bog of Allen. The Grand Canal, from Dublin to Shannon Harbour, passes through a wide extent of the bog district.

When bogs become consolidated or compressed they are called peat-mosses. An extensive tract of peat-moss (Chatmoose) in Lancashire at one time attracted considerable public attention, from the circumstances of the Liverpool and Manchester Railway having been carried through it. Chatmoose (6 miles long by 3 broad) has a depth of 30 feet of spongy moss, which Mr. Stephenson succeeded in making fit to bear a railway, by filling it with an enormous mass of earth. The late Mr. Roscoe brought part of Chatmoose into a state fit for cultivation by mowing and mounding.

Bogs not unfrequently burst out and suddenly cover large tracts. This phenomenon happened in 1835 near Randalstown, in Ireland. After a subterranean noise a portion of a bog moved forward a few perches, when it exhibited a broken rugged appearance, with a soft peaty substance boiling up through the chinks. It remained in this state three days, when it again moved suddenly forward, covering corn-fields, potato-fields, turf-stacks, hay-ricks, &c. The noise made by its burst was so loud as to alarm the inhabitants adjoining, who, on perceiving the flow of the bog, immediately fled. A similar phenomenon, but on a smaller scale, took place at Dummora in 1873. There is a great similarity between the peat-bogs and coal-beds; and some peat, from the bottom of deep layers, approaches coal in colour, lustre, and fracture.

BOG (the *Hypanis* of the Greeks and Romans), a tributary of the Dniéper, rises in the north-west of the Russian province of Podolia, before leaving which it receives the rivers Ingul, Balta, Tshertal, and Salonicha. The Bog flows generally in a south-easterly direction. It descends by a succession of falls in the vicinity of Sekohie, into the low country which lies between it and the Dniéper, where it winds its way through a marshy lake nearly 50 miles in length, and falls into the Dniéper to the east of the town of Oezakoff. It is about 480 miles in length, and in the latter part of its course attains a breadth of 500 feet; but its bed is so much obstructed by rocks and sandbanks, that it is navigable only when its waters are much swollen. The principal towns on its banks are Bratzlaff, Olyviopol, and Nikolaievsk. See DNEPR.

BOG BUTTER, a peculiar substance found in the peat bogs of Ireland. It resembles ordinary butter in colour and consistency, but is destitute of taste or smell, and is supposed to be formed by the decomposition of the peat. When analyzed it is found to consist of about 74 per cent. of carbon, the remainder being made up of almost equal portions of oxygen and hydrogen. It melts at 124° Fahr., is insoluble in water, but readily dissolves in alcohol, separating afterwards in needle-shaped crystals.

BOG-EARTH is an earth or soil composed of light silicious sand and a considerable portion of vegetable fibre in a half-decomposed state. It is in high repute with gardeners, being excellent for flowers, especially for some American plants, which thrive best in such a soil. Where it is not to be obtained in a natural state, it is easily imitated artificially, by mixing the mud of ponds or ditches, where the soil is light, in pits, with leaves, weeds, and grass, keeping the mixture well watered and frequently turned. It must then be exposed to the air for a considerable time in heaps until the requisite texture is produced. Some sharp sand is an essential ingredient, and must be added if there is none in the soil.

BOG-HEAD COAL or **TOR'BANITE** is a bituminous schist found in Lindlithgow, Scotland, which yields a large quantity of oil and solid paraffin. It has been much used for the manufacture of gas. The bed, however, is now nearly exhausted.

BOG-IRON ORE is a loose earthy form of limonite or BROWN HEMATITE (which is a hydrous sesquioxide of iron) found in bogs and low-lying places, generally underlying the peat, forming a "hard pan," and often containing fragments of wood, leaves, and moss; its occurrence thus bears some analogy to the iron ores of the coal measures. In Canada good cast-iron is produced from it, but the Swedish ores are rich in phosphorus, and are therefore principally used only for castings where a hard impression but not much strength is required. These ores are also worked in Prussia. From their porous nature they are well adapted for purifying gas, for which they are sometimes used in this country. The deposition of these ores appears to have been brought about by organic agencies. Lyell agrees with Ehrenberg in considering that bog-iron

ore consists of an aggregate of millions of plants of simple structure, *Gallionella ferruginea*. These organisms, under a very high power of the microscope, are seen to be slender jointed threads, the cell-walls of which are composed partly of a silicious, and partly of a ferruginous material. The lake ores of Sweden are similar deposits. It has also been suggested that the deposition may have been effected by the action of the oxygen of the atmosphere on an iron-bearing solution, or possibly by the formation of iron salts with some of the organic acids contained in the peat; the ferruginous solution having been derived from neighbouring strata either by the decomposition of pyrites or by the solution of iron salts by waters containing carbonic acid and some deoxidizing substance.

BOGOMILL, a curious religious sect of the twelfth century, whose chief seat was in Bulgaria. They resembled in some respects the Paulicians and Kathari, and their name, which was derived from the words "Bog," Lord, and "milui," pity us, or have mercy upon us, was given them on account of their numerous and fervent prayers for deliverance from the evil spirit. Their system of theology resembled in many points the dualism of the Persians, the evil principle of the universe being called Satanael, and the good principle the Logos or Christ. They professed to accept the books of the New Testament and the Psalms and Prophets from the Old, but they interpreted them after a method of their own. They rejected the sacraments of baptism and the Lord's supper, the latter of which they declared was a sacrifice offered to demons. Their leader, Basilus, was burned as a heretic by Alexius Comnenus in 1118, and they were subjected to considerable persecution; but a few members were in existence near Philippopolis in the beginning of the thirteenth century.

BOGOTA, or *Santa Fé de Bogota*, a city in South America, was founded by Quesado in 1538, and has been the capital successively of the vicerealty of Nueva Grenada, of the republic of Cundinamarca, then of the republic of Nueva Grenada, and lastly it now forms the seat of the central government of the federative republic of Columbia. It stands in $4^{\circ} 30'$ N. lat., $74^{\circ} 10'$ W. lon., and has a population of 51,000. The town is situated at the foot of two mountains, which shelter it from easterly winds and supply it with water. Bogota is slightly elevated above an extensive and fertile plain which lies to the west of it, and measures about 45 miles every way. This plain, which is surrounded by mountains, is 8640 feet above the sea. The river Bogota, or Funza, from which the town has received its name, winds through the centre of the plain, at the distance of 9 or 10 miles from the town. The climate of the plain and of the town is very temperate, owing to their elevation above the sea, and to the abundant rains.

Bogota is built in the form of a cross, of which the principal square and church form the centre. The streets are narrow, intersect one another at right angles, and are tolerably regular. All of them are paved, and the principal have footpaths, where the passengers are sheltered from the rain by the projecting roofs of the houses. A stream of water is constantly flowing through the middle of the streets. The city contains several spacious squares, all of which are adorned with fountains. At night the streets are imperfectly lighted by a few lamps. As Bogota is subject to frequent earthquakes, most of the houses consist of one or two stories only. They are built of bricks, the greater part are covered with tiles, and the external walls are whitewashed. The front wall presents only a few windows of different dimensions, without glass sashes, and defended by large iron or wooden bars. Two gates and an intervening passage lead to a spacious court yard, which is surrounded by a projection of the roof and a gallery when the house consists only of a ground floor, but by a verandah if it is of two stories. Round this gallery is a long suite of rooms, which receive daylight only through the doors.

Among the principal buildings of Bogota are—the cathedral, the convent of San Francisco, the palace occupied by the president of the republic, the mint, and the theatre. In 1876 a large and elegant capital was completed, for the reception of congress and for the various offices of state. There are a university and three colleges, all well built. Of the other literary and scientific establishments may be named the normal school; the museum of natural history, in which botany, chemistry, and mineralogy are taught; the protomedicate or school of medicine, the national library, the observatory, the botanical garden, and the national academy. The town is the residence of an archbishop, the seat of the congress, and of the high authorities of the state. The town has water communication by means of the Rio de Magdalena, down which the north coast is reached in about ten days, and by the Meta, which runs from the mountains E. of the town, and falls into Orinoco. The river Casiquiare, a natural canal, unites the Orinoco with the Amazon, thus offering an almost unbounded field to industrial enterprise.

BOGRA (*Bagura*), a British district occupying the east central portion of the Rajshahi Kuch-Behar Division, under the lieutenant governor of Bengal. It lies between $24^{\circ} 32'$ and $25^{\circ} 18'$ N. lat., and between $88^{\circ} 54'$ and $89^{\circ} 18'$ E. lon. The area is 1500 square miles, and the population 700,000. The district presents the usual appearance of an alluvial tract, consisting of one level plain, seamed with river beds and studded with marshes. The river system is constituted by the numerous channels of the great river of Rangpur, which is variously known as the Jista or Atrai. The Brahmaputra itself, locally termed the Daokha or Hatchet-cut, only fringes the eastern frontier of the district. The population is almost entirely rural. Out of a total of 2666 villages, 2342 each contain less than 500 inhabitants. Bogra, with 6000 inhabitants, is the only town with a population exceeding 5000. Rice constitutes the staple crop throughout the district, being especially predominant in the clay tract west of the Karatola. In the Brahmaputra valley oil-seeds are largely grown, and jute is cultivated. There is a considerable extent of waste land in most parts of the district, which is now in process of being reclaimed by hill-men from Churia Nagpur, in some places under the stimulus of European capital. The growth and preparation of indigo, which formerly attracted a large amount of European capital, has now entirely disappeared. River trade is brisk in all parts of the district. The chief exports are—rice, jute, mustard seed, sugar, hides, tobacco, and ganja. The imports are—salt, piece goods, pulses, spices, brass-ware, cocoa, and betel nuts. The Northern Bengal State Railway runs through the district. The climate of Bogra is somewhat less hot than that of the districts further to the west. The prevailing diseases are fevers and bowel complaints of various kinds.

BOG-WOOD is applied generally to the timber found in peat-bogs, and which is principally either oak or deal. The oak is of a deep ebony black colour, and is usually found at the base of the peat; ornaments are made of it in some parts of Ireland. This dark colour seems to be due to the action of a solution of iron upon the organic acids contained in the oak. The deals, found generally some distance above the oak, are used principally for firing, and where timber is scarce the "sticks" or trunks of the old trees are eagerly sought after.

BOHEMIA (in German, *Böhmen*) derives its name from the Boii, who once occupied the parts about the sources of Elbe and Moldau. It forms part of the Austrian empire. Bohemia is an irregular quadrangle in the S.E. of Germany, extending between $48^{\circ} 33'$ and $51^{\circ} 5'$ N. lat., and 12° and $60^{\circ} 46'$ E. lon.; it contains an area of about 19,960 square miles. It is bounded on the N.W. by the old kingdom of Saxony, on the N.E. by the Prussian province of Saxony and by Austrian and Prussian Silesia, on the S.E. by Moravia, on the S. by the archduchy of Austria, and on the

S.W. by the kingdom of Bavaria. Inclusive of the metropolitan district of Prague, Bohemia is divided into seventeen provinces or circles.

The country is inclosed on every side by lofty and in parts wild and dreary mountains. On the west side, and from a point close upon the Fichtelgebirge, issue two ranges, the one taking a N.E. and the other a S.E. direction. The first of these ranges, known under the name of the Erzgebirge (Ore Mountains), runs to the left bank of the Elbe between Tetschen and Schandau. It has a few mountain summits from 3000 to 4000 feet high. The south-east range constitutes the Bohmerwald-gebirge (Bohemian Forest Mountains). The Sudetesch chain extends south-east from the Elbe, and the Bohemian-Moravian chain forms the south-eastern boundary of the kingdom; so that Bohemia is entirely surrounded by mountains. Some of these mountains, in the eastern division, reach a height of 5000 feet. Bohemia is also intersected by minor ranges.

The interior of Bohemia presents an undulating surface, very frequently studded with high and pointed eminences, but with a general slope towards the centre of the country. The most extensive plains are in the provinces of Königgratz and Chrudim, from Neustadt to the Nassaberg acclivities. The country is full of valleys and mountain passes, among which we may mention the delightful valleys of the Elbe and Beroun; but the deepest is the Riesengrund or Giant's Glen among the Giant Mountains. All the rivers of Bohemia rise either within or close upon its borders. The Elbe (the ancient *Albis*, or the *Elbe* of the Bohemians) traverses the N.E. part of the country. It originates in the Giant Mountains; it descends as an impetuous torrent into the hill-country, receives a multitude of minor streams in its course, and assumes a blood-red tint after heavy showers, which is particularly remarkable in the neighbourhood of Josephstadt and Königgratz. It forms in many parts a rich alluvium by the overflowing of its banks, and quits Bohemia after a course of about 190 miles at Herrenkretschien, near Schandau, where it enters the kingdom of Saxony. The Moldau, the Eger, the Aupa, the Adler, the Mettau, the Iser, the Luschnitz, the Wottowa, the Sazawa, and the Beroun, are the chief rivers and streams. Bohemia is rich in mineral waters, many of which, such as Carlsbad, Seidlitz, &c., have acquired much celebrity. The climate is clear and salubrious, and in general cold, owing to the elevation of the country.

The soil of Bohemia varies considerably in productiveness, but it is nowhere entirely sterile except in certain parts of the Bohemian Forest and the mountains. The country produces almost every description of grain and pod seeds, but not much maize. Flax is grown in every province, but of various quality, and hemp is raised in some few quarters; rapeseed is also largely cultivated for the sake of the oil. Fruit abounds in all parts except the more elevated districts. Timber-trees, mosses, herbs, grasses, and medicinal plants, many of them of rare occurrence elsewhere, are plentiful in the mountain regions.

Bohemia contains large masses of quartz, granite, and sandstone; precious stones in great variety; marble, slate, and pottery clay; gold, silver, quicksilver, tin, lead, iron, bismuth, zinc, cobalt, arsenic, manganese, nickel, chrome; and small quantities of salt, coal, and black-lead. Bohemia has a breed of superior horses; the cattle are inferior; the sheep afford excellent wool; goats and swine are very abundant, as are also turkeys and geese. The stock of game has fallen off in those quarters where the population has increased, but Bohemia still possesses stags, deer, hares, wild hogs, pheasants, and partridges in abundance. Birds of prey abound. Considerable supplies of fish are obtained, including salmon, trout, eels, and craw-fish.

The population of Bohemia in 1880 was 3,560,819. There are about 180,000, Protestants, 100,000 Jews, and the rest are Roman Catholics. About one-third live in

towns, and two-thirds in the country. The houses amount to about 600,000. None of the towns are large, excepting the capital, Prague. Nearly two-thirds of the inhabitants of Bohemia, particularly those in the central and eastern provinces, are of Slavonic blood, and call themselves Czeches or Tschèches. In common with the Slovaks and their brethren in Moravia, they are descendants of the Lechi or north-western branch of the Slavonians, who were the first to cultivate and refine their native language. The Czeches are passionately fond of music and singing, and generally remarkable for intelligence and strength of memory. Next to this race, the Germans, who are nearly 1,000,000, are the most numerous; they chiefly inhabit the districts bordering upon Prussia, Bavaria, and Saxony. In mechanical and mercantile pursuits they are superior to the Slavonian inhabitants, and their language has become that of the educated classes throughout the country. The Jewish inhabitants appear to have been settled in Bohemia in very early times; they, as well as a few Italians, are mostly engaged in trading. Roman Catholicism being the prevalent religion, the establishment connected with it is extensive. The clergy consist of the metropolitan archbishop of Prague, the three bishops of Leitmeritz, Königgratz, and Budweis, a titular bishop, and twelve prelates; and the affairs of the church are conducted by the metropolitan and the three above-mentioned bishops. All other religions are freely tolerated. Education is much more widely diffused in Bohemia than in any other province of Austria, there being upwards of 8000 schools.

The landed property of Bohemia is almost universally in the hands of the nobility and a few peasants, who may almost be said to be the proprietors of the labourers on their estates, and exact heavy service from them. The produce of wheat and rye is tolerably abundant in some parts, especially in the province of Sazitz and the vicinity of Prague. The quantity of meadow and pasture land is somewhat deficient. The cultivation of fruit is pursued to the greatest extent in all the northern provinces, with a few exceptions. The finest orchards, or rather groves of fruit-trees, exist in the vicinity of Neustadt above the Mettau. Whole woods of plum-trees are met with near Melchówek, Weltrus, and other spots. Bohemia is, in fact, a large exporting country for apples, quinces, dried plums, pears, cherries, &c. Flax, hemp, dye-plants, hops, and the vine are the chief objects of culture in Bohemia. The wine produce is very small.

Few branches of industry are more valuable to Bohemia than the working of its mines. The gold and silver mines of Příbram, Joachimsthal, Eule, and Babin; the lead-mines of Příbram, Mies, and Bleistadt; and the iron-mines of Harzowitz, Ginetz, and Pilsen, are the principal. Mines of tin and of quicksilver, once productive, have since declined. Marble sandstone for building, and basalt for building and paving, are quarried in many parts.

Bohemia is one of the greatest manufacturing countries in the Austrian territory, especially in its northern provinces. The manufacture of glass, celebrated for its cheapness, lightness, and durability; the enamelled wares of Neuhaukenthal and Bürgstein; the linen, hair, tape, ribbon, and lace manufactures; cotton manufactures of a coarse but strong quality; calico-bleaching; wool and woollen manufactures; silk manufacture; tanning and leather working; porcelain and pottery manufactures; manufactures in iron, steel, copper, tin, and brass; paper manufacture—all are carried on to greater or lesser extent in Bohemia, and give occupation to about one-third of the inhabitants.

Bohemia, which possesses peculiar facilities for internal and external intercourse by means of the natural lines of communication of the Elbe and Moldau, carries on an active trade with the other parts of Austria, and with foreign countries. Its exports and imports each amount to from £3,000,000 to £1,000,000 per annum. Prague

is the centre of the chief commercial and money transactions, for which its situation peculiarly fits it. The country possesses roads, in general kept in excellent order, to the extent of nearly 1700 miles; and it has several lines of railway, most of which radiate from Prague.

For the education of the people there are normal seminaries, national schools, gymnasia or public schools, and a university at Prague. There are, besides, theological, philosophical, polytechnic, fine arts, musical, and agricultural schools and institutions.

Notwithstanding Bohemia may be truly said to be the cradle of the Reformation, and the determined and long-continued stand her inhabitants made in defence of the doctrines promulgated by Huss and his followers, she is now become one of the principal strongholds of Catholicism. The Bohemians are passionately fond of music and dancing, and have attained to great proficiency in both. The national airs are nearly the same as those of the Slovaks of the N.W. part of Hungary, and are generally plaintive. The waltz is the favourite dance; and two of its most fashionable varieties, the *redowak* and the *galeppe*, have been borrowed from the Bohemian peasants. The men are generally robust and well-proportioned, and the women are celebrated for their beauty. The dispositions of the people are more mercenary, and their manners more gay, frank, and open, than those of their Saxon neighbours. However much the objects of their veneration may be changed, they are still, as in the days of Huss and Jerome of Prague, zealous defenders of what they believe to be right and proper. There is a nearly total want of a middle class—an intermediate rank between the lords and their vassals. With the exception of Prague, there are no great towns, none of those *foci* whence intelligence and civilization are diffused over a country. But, however ignorant and prejudiced, the character of the Bohemian peasant is most respectable, and in point of morals he is quite on a level with the peasantry of other nations.

The civil administration of the country is vested in a central government, subordinate to the higher authorities in Vienna; its seat is Prague, and its president is styled the superior burgrave. Judicial affairs fall under the superior cognizance and control of a court of appeal and bench of criminal justice in the same capital. On the establishment of constitutional government in Austria, Bohemia was included as one of the seventeen divisions of the empire to which a provincial diet was granted.

The Bohemians were governed by their own sovereigns till the early part of the sixteenth century, when the crown reverted by marriage to the House of Austria. In the century following it was nearly snatched from the imperial grasp. Strongly attached to the reformed faith, and having had their liberties assailed, the people revolted, elected a king, Frederick V., the palatine of the Rhine, son-in-law of James I. of England, who accepted the dignity but was unable to retain it. Totally defeated by the Imperialists at the battle of the White Hill, near Prague, in 1620, his adherents speedily felt the full weight of the imperial vengeance. Wholesale executions followed; Protestantism was proscribed; and by relentless persecution, with the voluntary expatriation of thousands, its profession became extinct in the land of Huss.

BOHEMIA, FOREST OF (called in German *Böhmer-Wald*, and by the aborigines of Bohemia, or Czechs, *Szumava*) is a mountain range of considerable extent. It separates in the greatest part of its course Bohemia from Bavaria. Its direction is nearly N.W. and S.E., from near the town of Eger to that of Linz. The south-western declivity is very abrupt, the north-eastern much less so. Several minor ridges branch out of it to the centre of Bohemia. The main ridge presents many heights of 4000 feet and upwards, but the main ranges are less elevated. The breadth of the main range averages from

12 to 16 miles, but the district is so rugged that few roads traverse it. The streams from the northern slope flow into the Elbe; those from the southern into the Danube.

The Forest of Bohemia is mostly composed of primitive rocks. The highest part of the ridge and its most elevated summits consist of granite. Gneiss everywhere accompanies the granite, but prevails in the Forest of Brdy, where it advances far into the interior of Bohemia. Mica slate is also frequently met with in the same tract. Primitive clay-slate frequently covers the granite and gneiss formation. Forest trees clothe the lower slopes. Metallic veins, marble and precious stones, building stone, and coal, are found in the mountains. See **BOHEMIA**.

BOHEMIAN BRETHREN, a religious society which was formed after the breaking up of the Hussite confederation in the middle of the fifteenth century. They called themselves "Brethren of the Law of Christ," and were generally called either the Bohemian or the Moravian Brethren, from the place of their dwelling. They endeavoured to form their societies on the model of the primitive church, as made known in the New Testament, and rejected the doctrines founded upon tradition, such as purgatory, saint-worship, the adoration of Mary, and the doctrine of transubstantiation. They were opposed to war, and refused to bear arms, coming in consequence under the displeasure of their respective governments. They were frequently persecuted, and their communities were broken up and destroyed during the Thirty Years' War. They afterwards reformed their societies, but with diminished numbers, and most of them are now found in Poland.

BOHEMOND, the eldest son of Robert Guiscard, the Norman conqueror of Apulia and Calabria in the eleventh century. After Robert had become duke of Apulia and Calabria, and his brother Roger had made himself count of Sicily, Bohemond accompanied his father in his various expeditions to Greece and Illyria against the Emperor Alexis Comnenus. His father returning to Italy, Bohemond remained in Illyria with his Norman and Apulian army. He defeated the Greeks near Arta, entered Thessaly, and besieged Larissa. At his father's death, in 1085, Roger, Robert's second son, took possession of Apulia and Calabria. Roger, count of Sicily, Robert's brother, took the part of his nephew and namesake against Bohemond. A war ensued between the two brothers, which terminated by Bohemond accepting the principality of Tarantum, and leaving his brother Roger in possession of the rest. When the great Crusade was resolved upon in 1092, part of the Crusaders took their way through Italy, and assembled at Bari to embark there. Bohemond, bold and aspiring, resolved upon joining them, and succeeded in withdrawing nearly the whole of his brother's army, which was then engaged in the siege of Anadli. Both the Prince of Salerno and Tancred, the hero of romance immortalized by Tasso, and who was Bohemond's cousin, being the son of Emma, sister of Robert Guiscard, agreed to follow Bohemond's banner. The Norman and Apulian expedition embarked at Bari, and landed at Durazzo. After the capture of Nicea, 1096, Bohemond, who commanded the left division of the Crusaders, was attacked by a vast multitude of Turks near Dorylaeum, and his division was mostly cut to pieces, but by his exertions he maintained the conflict until Godfrey of Bouillon came to his assistance and routed the enemy. Antioch was taken treacherously by his means, and he was made its prince; but it had no sooner come into the possession of the Christians than they were besieged in their turn, and after suffering the extremities of hunger they came out to offer battle, in which the Saracens and Turks were completely routed, and Bohemond greatly signalized himself. When the Crusaders left Antioch in the spring of 1099 for Jerusalem, Bohemond accompanied them as far as Laodicea, and then returned to Antioch to consolidate his new possession. He afterwards received the investiture of his principality from

the patriarch Daimbert at Jerusalem. In an excursion into Mesopotamia he was taken prisoner by a Turkish emir, and remained two years in captivity. Returning to Antioch he found there the faithful Tancréd, who had taken care of his interests during his absence. In 1106 he repaired to France, where Philip I. gave him his daughter Constance in marriage; Philip's natural daughter Cecil married Tancréd. Upon Bohemond's return to Italy he collected a large force, and sailed from Bari for Durazzo. After several combats with Alexis' troops he had an interview with the emperor, in which the latter acknowledged him prince of Antioch. Bohemond died in Apulia in 1111, and was buried at Canosa. His son, Bohemond II., succeeded him as prince of Antioch. (Gibbon; Mataterra's "Chronicles of Robert Guiscard;" Michaud, "Histoire des Croisades.")

BOHME or **BOHM, JACOB** (frequently miswritten *Behmen*), was the son of poor parents, and born at Alt-Seidenberg in Upper Lusatia in 1575. His first employment was the care of cattle, but when grown older he was placed at a school where he learned to read and to write, and was afterwards apprenticed to a shoemaker in Górlitz.

From early youth Jacob Bohme was an attentive reader of the Scriptures, and was favoured with what he considered as divine revelations, the particulars of which he has related in his works. He looked carefully after his family, and lived in peace till in the year 1610 he wrote his first book, called "Amora," or the "Morning Redness." This work by accident became known while yet in MS., and excited the displeasure of the senate of Górlitz, who seized his book, and admonished him to stick to his last and leave off writing books.

Upon the command of the senate he abstained from writing for seven years, after which he commenced again to write. The writings of Bohme occasioned him so much persecution and uneasiness that he left Górlitz, and was afterwards cited to Dresden, where he was examined in the presence of the Prince Elector of Saxony concerning them, and his answers being deemed satisfactory he was dismissed. He afterwards returned to Górlitz, where he died, 18th November, 1624.

After Bohme's death his opinions spread over Germany, Holland, and England. The first collection of his works was published by Heinrich Boke (Amsterdam, 1675, 4to). Translations into Dutch and English were also issued, and a large number of writings by other persons in a variety of languages on the subjects contained in them. The best translation of his works into English is that by the celebrated William Law of Oxford (London, 1761, in two volumes 4to).

BOIELDIEU, FRANÇOIS ADRIEN, was born at Rouen in 1775. His father was secretary to the archbishop. At a very early period of his life he manifested a most decided talent for music, and at eighteen wrote a one-act opera, which was produced at Rouen. In 1795 he went to Paris, and brought out several compositions, of which many met with great success, and some are still admired. Among these were "La Famille Suisse," "Benicowski," "Le Cante de Bagdad," and "Ma Tante Aurore." On the establishment of the Conservatoire de Musique by the National Convention, Boieldieu was appointed one of the professors. In 1803 he accepted from the Emperor Alexander the appointment of *maître de chapelle* at the imperial court of Russia, and composed for the Hermitage Theatre some operas and various smaller dramatic works. In 1811 he returned to Paris, and there, among other operas, produced "Monsieur de Paris," "Le Petit Chaperon Rouge," and his greatest work, "La Dame Blanche." He afterwards was called upon to compose music for the baptism of the Duc de Bordeaux and the coronation of Charles X. After a short illness he died, 8th October, 1834, aged fifty-nine, and his funeral was celebrated with much pomp.

BOII, a nation of ancient Gaul, which made various immigrations into Italy and Germany. Part of them appear to have settled in Germany, in the country called after them Boiohemum (Bohemia), from which they were afterwards driven away by the Marcomanni, and withdrew to the banks of the Enns (Inn). Bojodurum, now Innsstadt, took its name from them. The Boii are mentioned also as having immigrated into Italy, with the Lingones and other tribes, by passing over the Pennine Alps; but the date of the immigration is doubtful. The Italian Boii crossed the Po, and settled in the country between the Taurus, the Silarus, and the Apennines, and they took possession of the Etruscan city of Felsina, afterwards Bononia. [See BOLOGNA.] They were finally removed by the Romans, and sent across the Noric Alps, when they settled on the banks of the Drave.

The Boii who had settled on the banks of the Enns became subject to the Roman empire. Their country afterwards took the name of Boicaria or Boiaria, some writers say from the united names of the Boii and the Avai, a Pannonian tribe. From Boiaria the modern appellation of Bavaria is derived.

BOIL the name given to a painful tumour of an inflammatory nature seated in the skin and in the cellular tissue beneath it. It may occur on any part of the external surface of the body, and sometimes several appear at once. The ordinary boil usually begins as a little lump beneath the skin, which is soon followed by inflammation and an external swelling of a conical appearance. As it increases in size its whole surface becomes exquisitely tender, and it is generally accompanied with a very painful sense of burning and throbbing. This period varies in length from four to eight days, when the boil bursts and lets out a little matter. This is followed in a day or two by the core or slough of cellular tissue, after which it rapidly heals.

Another kind is that known as a "blind boil." This generally commences as a small pimple surrounded by an inflamed and tender ring of flesh. It is attended with a throbbing pain, and is much flatter in appearance than the ordinary boil. It usually bursts and discharges a little matter, followed by a small core or slough.

Boils may be brought on by a variety of causes, and must generally be regarded as being constitutional in their origin, having their source in the disturbance of some internal organ or of the system in general, though they sometimes attack persons in robust health. Men who go into training for athletic sports are often troubled with boils, while, on the other hand, they often appear after fevers and other exhausting diseases during the period of convalescence.

The treatment of boils is both local and general. The latter must be varied according to the state of the health, having reference to the correction of the disordered state of the system in which the disease has its origin. Among the medicines used internally for the prevention or cure of boils are sulphide of calcium, belladonna, and sulphur. The former will often, if taken early, cause the inflammation to disappear and the boil to dry up without breaking. When it is too far advanced to be thus dispersed, this medicine usually causes it to ripen and heal more quickly, and reduces the pain and inflammation. It may be taken hourly in doses of one-tenth of a grain, or in the form of a powder composed of twenty-four grains of the sulphide to half an ounce of the sugar of milk. Of the latter the dose is five grains every four hours. When belladonna is used it is best taken in the early stages of the complaint, in doses of two drops of the tincture in a little water every two hours. Sulphur is usually used as a preventive, a few grains being taken three or four times a day. Sometimes it may be necessary to cleanse the stomach and bowels by means of laxatives, and to follow this by the administration of tonic medicines.

Local treatment consists of hot fomentations and poultices until the boil bursts, when a little wet lint will form a sufficient dressing. Where there is much pain a free incision will often afford relief, as it allows the matter to escape, and renders the passing away of the core more rapid and easy.

BOILEAU, NICOLAS SIEUR DESPREAUX, was born near or in Paris, 1st November, 1636, and was the eleventh child of Gilles Boileau, first registrar (*greffier*) of the great chamber of the Parliament of Paris. His mother, the second wife of Gilles, was Anne de Niells. Two elder brothers of Nicolas Boileau attained some distinction.

GILLES, born in 1631, pursued the law, and was a member of the French Academy. He published a translation of the "Encheiridion" of Epictetus and of the "Tablet" of Cebes, &c. His posthumous works, consisting of poems, letters, his speech on admission into the Academy, and a translation of the fourth book of the *Æneid* into French verse, were collected in one volume 12mo. Gilles died in 1669.

JACQUES was born in 1635, and studied at the College of Harcourt, where he graduated in theology. In 1691 he was promoted to a canonry in the Sainte Chapelle at Paris. He died in 1716. His avowed works are numerous, but chiefly on forgotten questions of theology. A complete list of his works is given in the twelfth volume of the "Mémoires" of Nicéron.

NICOLAS BOILEAU, the poet, is believed to have been born at Paris. At the College of Beauvais, in which he finished his education, his predominant taste was discovered by Sevin, one of the professors. Both the law and the church were at first thought of for his pursuit; but the law had few attractions for him, and although he obtained from the church a priory of 800 livres annual rent, he afterwards resigned it, and most honourably distributed in charities the whole of his calculated receipts. His earliest poetical attempts were in satire, by which he nullified a prediction made by his father, who, when comparing the genius of each of his three sons, used to say "that as for Colin, he would never speak ill of anybody." But the seven satires which Boileau published in 1666, with a preliminary address to the king, were playful and sportive, not rabid and violent; they showed, as he used to observe of himself, neither fang nor talon. They excited considerable attention among the lettered circles of the capital by a terseness of language and the polish of versification to which the public ear had not heretofore been accustomed.

The fearlessness of Boileau's attack upon the bad taste which had elevated Chapelaine and Quinault to the loftiest poetical eminence was quickly repaid by general applause, by royal favour, and by substantial patronage. Boileau received a considerable pension, and when the treasurer's clerk one day inquired where were "the works" for which the order instructed him to make this payment, the poet amused himself by answering that he was a "builder." He was also appointed joint historiographer with Racine, an office which appears to have been regarded by both of them as a sinecure, unless so far as they contributed some illustrations to a "Medallie History." In 1684 Boileau had the melancholy task of announcing to the king the death of his historiographical colleague. In the same year he was admitted a member of the Academy. Twelve "Epistles" which flow with much greater ease than the "Satires," were produced between 1669 and 1696. The "Art of Poetry," accompanied by a translation of "Longinus on the Sublime," with critical remarks on that writer, was published in 1673, in which year also appeared four cantos of the "Lutrin," a mock heroic suggested by the President Lamoignon. The two concluding cantos were not appended to the "Lutrin" till ten years after its first appearance. The minor poems which escaped Boileau from time to time are altogether unworthy of his pen. "Jes

Héros des Romans," a dialogue after the manner of Lucian (as all dialogues at that time were said to be), is the chief of his original prose works; it was written in the beginning of 1668, and it very pleasantly exposes the absurdity of Honoré d'Urfé, Madame de Scudéry, and their imitators. It probably gave a death-blow to the "Astrées," the "Cyrus," and the "Clelies," and it formed part of a controversy which at that time raged in France, and which produced lasting enmity between Boileau and Fontenelle—the comparative merits of the ancients and moderns. Boileau lived till 1706 in familiar intercourse with the choicest contemporary writers, and in the enjoyment of the best society of the capital, after which he retired, and closed a very blameless and honourable existence peacefully and piously, 13th March, 1711, in his seventy-fourth year. More than 350 editions of his works have been published, sixty of which were issued during his lifetime. Among the best of the later editions is that of Beiriat Saint Prix (Paris, 1830-60).

BOILER is the name applied to the vessel in which steam is generated for working steam engines. The material used for their construction is, with few exceptions, wrought iron or mild steel. With the view of economy, strength, durability, or compactness they are made of various forms; but no one form, however, can lay claim in a perfect degree to all these advantages, for to construct a boiler of the greatest strength we would require to adopt, as nearly as possible, the spherical form. But as this type would expose so little heating surface in proportion to its contents, it would therefore be of a most wasteful character.

Boilers may be said to be divisible into three classes, viz. land, locomotive, and marine. The type of land boiler which has been most favourably received and adopted by many steam users, is that known as the Lancashire boiler, introduced by the late Sir W. Fairbairn. One of its chief recommendations is its extreme simplicity, as will be seen from the accompanying Plate, fig. 1. A fusible plug is frequently fitted in the top of the furnaces, to prevent a collapse of flue from taking place should the plates become overheated through shortness of water. They consist of an alloy which melts whenever the water becomes too low in the boiler; but care is required to keep them free from scale and in good order, for it sometimes happens that on this account they have been rendered useless.

The gases, after leaving the internal flues, pass under the bottom of the boiler, and then along the two side flues, and afterwards into the main flue and up the chimney. The heated gases do not come into contact with the plates above the water line, as this would cause the circular seams of the shell of the boiler to be subjected to a very excessive strain, arising from the great difference of temperature between the plates in contact with the water and those in the steam space. The disastrous explosion at Blackburn in 1874 was attributed to this objectionable method of setting boilers. As corrosion may proceed to a dangerous extent on the outside of the shell plates of the boiler, from leakage at the seams or dampness of seating, the external flues are constructed so as to be accessible for examination.

Galloway tubes are frequently fitted in each internal flue, which not only increases the efficiency of the circulation of the water, but also gives additional strength to the flue. In some cases the high temperature of the upper part of the flue has caused arching or hogging to take place, from its upper part having lengthened, resulting either in leakage at the circular seams of the flue or grooving of the end plates. The flanged seam and Bowling ring have been adopted to obviate this, both of which means have been attended with some amount of success; as also the plan of tapering the flues at the ends where attached to the end plate, thus giving a greater breathing space between the end of the gusset stay and the junction of the flue to the end plate.

Locomotive boilers (Plate, fig. 2) belong to the class known as multitubular, and owing to the great pressure which these boilers are required to sustain, the manner of their construction, together with the quality of material and workmanship, should of necessity be of the highest class. The barrel or shell of the boiler is usually constructed of wrought-iron, and attached to the fire-box and smoke-box tube plate by an angle iron or flanged plate. The external plates of the fire-box are also of wrought-iron, while those internally are mostly made of copper, on account of that material being a better conductor of heat than wrought-iron. These plates at the sides are connected to the external plates by stays screwed through both plates, and their heads riveted over. As this plan cannot be followed with regard to the top of the fire-box, the method generally adopted is by fixing girders across the top of the fire box in the water space, and connecting them to roof-stays which are fastened to the plate above. The tubes are made either of brass or iron, and are secured to the tube plates by means of ferrules.

The form of marine boiler is invariably cylindrical (the sides of which are sometimes flattened) and multitubular. Owing to the limited space which it must occupy in steamers, the furnaces, fire box (or combustion chamber), and tubes are all contained within the shell of the boiler. As will be seen from the sketch (fig. 3 in Plate), the furnaces are connected to the front end of the boiler by means of flanged plates; formerly angle iron was used for this purpose, but on account of its ready nature it was very liable to split in the direction of its length, and hence its disuse; great care, however, is required in the flanging of plates, as they are apt to crack at the bend if the work be unskillfully performed by the smith. In fitting the boiler tubes they are first driven through both tube plates until they project about a quarter of an inch into the fire-box; the ends of the tubes are then expanded by means of a mandrel or tube-expander, and the ends in the fire-box are then beaded over; but in the smoke-box they are left simply expanded, so that in case of leakage they may be driven a little further through and re-beaded, and thus made water-tight. The end plates are stayed by means of longitudinal bar stays fastened with nuts and washers on each side of the plates, and in some cases gusset stays are also added similar to those seen for land boilers in fig. 1. The method generally adopted for staying the tube plates is by converting some of the tubes into stays, which is done by screwing a thread on their ends and securing them by nuts to the plates, or they may be simply screwed into the plates and their ends beaded over.

In the brief description of land and locomotive boilers, no mention was made regarding the method of attaching the plates to each other; the following will therefore suffice:—Along the edges of the plates one or two rows of holes are drilled or punched, and the plates overlapping one another are then firmly secured together by means of rivets placed in the holes and riveted up tight while hot. This plan is what is termed a lap-joint; the edges are afterwards carefully caulked. Or the plates may have their edges butted, and covered by means of a narrow plate called a butt strap; the latter method is what is known as a butt-joint. After the boiler has been completed, it is usual to test it by hydraulic pressure to twice its intended working pressure. All boilers are usually fitted with the following mountings:—The safety valve, for relieving the boiler of any undue pressure of steam; a stop valve, for communicating or shutting off the steam from the engine or adjacent boilers; a feed valve, for regulating the supply of water; steam cocks, for changing the water or removing any sediment from its surface; blow off cocks, for emptying the boiler; a pressure gauge, for indicating the pressure in pounds per square inch to which the boiler is subjected; gauge cocks and gauge glasses, for ascertaining the height of water in the boiler; and in some cases a salinometer cock, for the purpose of drawing off a portion of the water

in order to test its density. This, however, since the adoption of surface condensers, is not so much used as formerly, when the common jet condenser was fitted to engines.

BOILING OF LIQUIDS. When liquids are heated to the point of passing into vapour, and are thrown into violent agitation by the efforts of the globes of vapour to rise and free themselves from the surrounding liquid, they are said to boil, or be in a state of ebullition. Under similar circumstances the temperature at which this occurs is always the same in the same liquid, and is called its *boiling point*, being the greatest heat which the liquid is capable of acquiring. The considerable amount of heat absorbed during the passage from the liquid to the gaseous state of a body—that is, the heat (not shown by the thermometer) between the hottest liquid and the coolest gas of the same substance—is called *latent heat*. In ordinary air most metals, though rendered fluid by melting, never boil, and many oils become decomposed before reaching a temperature at which they would otherwise boil.

When water is heated there is a point, just before it has acquired its highest temperature, at which a slight noise, or rather a succession of noises, is heard, usually called *simmering*. This is occasioned by the formation of minute bubbles of vapour at the bottom of the vessel, and nearest the source of heat, which, being specifically lighter than the water in which they are formed, rise into the upper and cooler part of it, and are then condensed. Soon after this, and when the whole of the water has acquired its highest temperature, the bubbles of vapour rise to the surface, and there bursting constitute steam, which, being transparent and colourless, is consequently invisible; but when it comes into contact with the cold air it undergoes partial condensation, becomes visible, and appears as a mist. This temperature, under average circumstances, is about 212° Fahr., but with variations according to the density of the air, which is affected by the height above sea-level. It varies as follows:—

On ascending mountains, in consequence of the diminution of atmospheric pressure, and in proportion to it, water is found to boil at a lower temperature. Thus, on the summit of Mont Blanc, which is about 15,000 feet above the level of the sea, water boils at 178° Fahr., or 34° below its usual temperature. Water in vacuo boils at about 72°. On the other hand, if the pressure of air be increased the boiling point becomes higher.

The boiling point of any one liquid, as above stated, depends mainly on the pressure to which it is exposed, but it is also slightly affected by the substance of the vessel containing it, and the contiguity or immersion of other bodies. During the whole time of boiling—that is, as long as there is any liquid remaining—the temperature remains the same. Suppose, for example, a pint of water to be boiled in an iron vessel with a thermometer immersed in it, it would gradually be converted into steam, and the quantity of water in the vessel would be continually diminished, but until the whole of the water had been converted into steam the thermometer would register the same temperature. The following are the boiling points of a few liquids under the same atmospheric pressure:—

	Boiling point.
Hydrochloric ether,	52
Sulphuric ether (sp. gr. 0.7365 at 48°),	113
Bisulphide of carbon,	113
Acetic ether,	160
Nitric acid (sp. gr. 1.5),	210
Water,	212
Oil of turpentine,	314
Naphtha,	320
Phosphorus,	554
Sulphur,	570
Sulphuric acid (sp. gr. 1.848),	600
Mercury,	662

BOIS-LE-DUC (in Dutch, *S' Hertogenbosch*) is a fortified town, and the capital of North Brabant in the kingdom of the Netherlands, near the confluence of the rivers Dommel and Aa. It stands in 51° 42' N. lat., 5° 16' E. lon., and has a population of 25,000. Bois-le-Duc is a clean well-built town, about 5 miles in circumference, and contains many good streets and squares; it is intersected by canals, over which are upwards of eighty bridges. The town-hall, which stands in the principal square, is a handsome building. The town contains four Catholic and two Reformed churches. Of these churches that of St. Jean is one of the finest in Holland. The town also contains an academy of painting, sculpture, and architecture, and a grammar-school, in which Erasmus and Gravesande received instruction. Linen thread, ribbons, pins, needles, cutlery, and musical instruments are manufactured in Bois-le-Duc, which is favourably situated for carrying on trade by means of the Diest (formed by the united waters of the Dommel and the Aa), the Maas, and the Bois-le-Duc canal, by which the town has communication with Maestricht.

BOJADOR, CAPE, on the west coast of Africa, in 26° 12' N. lat., 14° 10' W. lon., forms one of the projecting points of the Great Desert; it rises to a considerable height, and is the western extremity of a rocky ridge, which is called by the Moors *Jebel Khal*. The coast, which extends northward to Cape Nun, is one of the most dangerous on the whole globe, being so flat that one may walk a mile into the sea without being in water over the knees. Vessels consequently strike at a very considerable distance from the beach. Besides, this low coast is always enveloped in a hazy atmosphere, which extends for many miles out at sea. The danger to vessels is still further increased by the prevalence of westerly winds, and by the currents along the whole coast from Cape Blanco to the Straits of Gibraltar, which set in towards the land with great force and rapidity. Cape Bojador was doubled by Gilianes, the Portuguese navigator, for the first time in 1432 or 1433. The name Bojador is from the Portuguese *bojar*, which signifies "to bend outwards," and hence it is applied to a part of a coast which projects into the sea.

BOJAR (pronounced *Bo'yar*), a title formerly given to an important class of the Russian nobility. The original nobility of that country were composed of persons descended from the leading warriors of the first Russian monarch, who received large fiefs in the country which their valour had enabled their chief to win. The fiefs seem to have been held by the sole term of military service. This was due to various superiors, who were known as princes, but they were not feudatories, inasmuch as they gave their services to a prince of their own selection, and shifted their allegiance when they felt disposed. They had a right to all the highest military and civil posts in the kingdom, kept around them bodies of their retainers or partisans, and exercised so much influence that they were always included in the imperial ukases, the formula of which was—"The Czar has ordered it, the Bojars have approved it." In this order, though property and titles were hereditary, by a curious custom peculiar to Slavic life rank was wholly personal. This custom was termed *miestnichestvo*, and it bears some resemblance to the practices of the Chinese. Rank depended upon military dignity conferred by the czar, on the appointment to other departments of state service, precedence being granted according to seniority of service. Peter the Great, among the alterations he introduced into the national life of Russia, suppressed the peculiar privileges of the Bojars, but compensated them for this by raising them to the rank and some of the privileges of the higher nobility.

BOKHARA is a country of Central Asia, between 37° and 41° N. lat., and 62° and 69° E. lon. It was known to the Greeks and Romans under the names of Sogdiana, Transoxiana, and Bactria. A considerable stretch of country,

including the important towns of Balkh, Andkhui, and Moimene, was at various times regarded as an integral part of the khanate; these places, however, have been absorbed by Afghanistan, and at present the river Oxus forms the southern boundary of Bokhara. To the west it is continuous with Khiva and the desert of Kharezmi, and on the east it stretches to Kunduz and Khokand. Its area is estimated at 100,000 square miles. Bokhara forms the south eastern corner of that remarkable depression which extends northwards to Saratow on the Volga, in Southern Russia, and southwards to the Hindu Kush. The surface of this extensive depression, which occupies all the countries to the north and east of the Caspian Sea, and those surrounding the Sea of Aral on all sides to a great distance, is nearly a desert, the soil of which is commonly a stiff clay of great aridity, covered here and there by sandy hills of small elevation. Bokhara partakes of the disadvantages of such a soil; but being surrounded by high mountain ranges at a short distance on the east and south, it enjoys a considerable supply of water, by means of which the industry of the inhabitants has changed considerable tracts into fertile fields and beautiful gardens.

A few mountain ridges, of which two are the Akh Tagh (White Mountains) and the Kara-Tagh (Black Mountains), intersect the northern part of the country; but the remainder is an open plain, with a few hills. It is watered mainly by three rivers. The Zarafshan rises in the mountains eastwards of Bokhara, flows through the towns of Samarcand and Bokhara, and empties itself into the salt lake of Kara-Kool. The Kasha or Kun-lac river rises in the Kara Tagh, flows through Shahr-Sabz and Kushoe, and loses itself in the desert. The third chief river, the Amu Daria, is described elsewhere. See OXUS.

Many of the plains, rivers, and valleys of Bokhara are covered with houses, orchards, and fields divided into small squares, of which the edges are formed by a fine turf raised about a foot above the plain, for the purpose of retaining the water which has been introduced into them. The numerous canals, as well as the roads, which are very narrow, have commonly rows of large trees planted alongside them. The climate is regular and constant. The summer commences at the beginning of March, and lasts till October. In this season it does not rain; the thermometer rises in the cultivated grounds to about 90°, and in the deserts to 100°. The nights are cold. October is the first season of rain, which continues for two or three weeks. In November and December it begins to freeze a little, and sometimes a small quantity of snow falls; but even in the latter months some fruits, as melons, are left in the gardens. The coldest month is January, February is rainy, and March recommences the fine season. A prevalent N.W. wind, by raising clouds of dust, causes much ophthalmia among the inhabitants. In other respects the climate is healthy.

The industry of the natives is most conspicuous in the cultivation of their lands. The larger and the smaller canals, both of which are numerous, must have required a good deal of labour when they were first made; and they are still kept up at a considerable expense. Besides this, the agricultural labour is rather more difficult than in Europe. The irrigation of the fields can only be effected, in winter, from December to the middle of March; and in summer, when the rivers are supplied with water by the melting of the snow of the mountains. Even the Zarafshan is dry for three or four months in summer. Rice, wheat, barley, pease, beans, lentils, turnips, carrots, onions, radishes, and beet are among the edible plants cultivated. Jawane (*Holcus saccharatus*) and trefoil are cultivated for pasture. Fruit is raised in great variety and abundance. Cotton, hemp, sesamum, tobacco, and a few dye-stuffs are also cultivated. Timber-trees are met with in the mountains, and poplars and willows in the plains.

Sheep and goats are among the principal riches of the

country. The sheep have large tails, which sometimes grow to such a size as to yield 15 lbs. of tallow. There is also a variety having a jet black curly fleece. The goats are the same kind as those of the Kirghis: they yield a shawl-wool little inferior to that of Tibet. Camels are numerous, and constitute the beasts of burden; a waterproof cloth is made from their hair, which is shed in summer. There is no native breed of horses. The cattle are few in number and of moderate size. The asses are large and strong, and used both for saddle and burden. Among the wild animals are tigers of a diminutive species, wild hogs, antelopes, wild asses, foxes, wolves, jackals, wild cats, bears, tortoises, and lizards. The scorpion is common. Of birds there are eagles, hawks, cranes, plovers, water-fowl, and wild pigeons. Fish abound in the river Oxus and the Lake of Dzungi. Silk-worms are reared in all parts of the country where there is water, every rivulet being lined with the mulberry.

Gold is found among the sands of the Oxus, and collected from it in many places along its banks. All other metals are imported from Russia. Salt is dug out in masses in some parts of the desert, and on the banks of the Oxus, below Chardjooee. Alum and brimstone are obtained in the neighbourhood of Samarcand, and sal ammoniac in its native state occurs in the mountainous district.

Almost the only manufactures carried on in Bokhara are those of cotton goods, silks, carpets, leather, hardware, and jewelry. Swords and knives are fabricated, and excellent paper of raw silk made.

The most remarkable towns of Bokhara are the present capital, Bokhara, Hissar, and Kashi. Samarcand was formerly one of the cities of Bokhara, but is now included in the Russian province of Zarafshan.

Bokhara, being situated between the two elevated tablelands of Asia, has frequently been invaded by the nations who inhabit each of them, and on such occasions a portion of the conquering nation has remained in the country, and settled there. At present twelve different nations may easily be distinguished: namely, Uzbeks, Tadjicks, Turcomans, Arabs, Persians, Mongols or Kalmucks, Kirghis, Kara-Kipjaks, Jews, Afghans, Lezhis, and Gypsies. The Uzbeks compose by far the greatest number of the inhabitants. The structure of their body and their language prove that they belong to that widely spread race which up to our times was known by the name of Tartars, but is now, with more propriety, distinguished by the name of Turks. The Tadjicks are industrious and intelligent; they claim descent from the ancient Bactrians. The population is estimated at 1,500,000, and the area at 100,000 square miles.

Bokhara has for ages been reckoned the centre of Musulman civilization; and in view of the number of its schools and the state of education among its people it would certainly seem, in this respect, to rank first among the states of Central Asia. Upwards of one-fourth of the population can read and write; and primary schools are everywhere. The people are, however, very superstitious.

It is vain to trace the history of ancient and mediæval Bokhara to that of more modern times. The annals of ancient Bokhara, or Bactriana, are more familiar and better identified with the rest of the world, because the two greatest rulers of the country, Genghis Khan in the thirteenth, and Timur Lench in the fifteenth century, compelled the attention of the West by their expeditions in that direction. After the death of Timur Lench (or Tamerlane) his empire was broken up and divided by quarrels among his sons and successors, and the later history of the country is very obscure. Its native rulers during the present century, especially the late Amir Nasrullah, appear to have been infamous for their cruelty and debauchery. Public attention in England was drawn to Bokhara in 1842 by the murder of Colonel Stoddart and Captain Conolly, and

their deaths would have been avenged but for the disasters of the Afghan campaign. The march of Russia towards Central Asia was fast accelerating under the ambitious designs of Czar Nicholas. It was stopped for a time through the Crimean War, but in 1868 the soldiers of the czar entered Samarcand, and the same general took possession of the capital of Timur who subsequently, in 1873, carried the Russian eagles victoriously into Khiva. Though still nominally under native sovereignty, Bokhara is really under the vigorous "protectorate" of Russia, and the replacement of Tartar savages by Russian governors has unquestionably been an unmixed benefit to the governed. This ancient and distant country of Asia has indeed entered on the path of the modern world and of modern ideas. Towns and countries hitherto unknown to the western world have been thrown open, and places where the European traveller could only venture in disguise and at the peril of his life are now not only free and safe, but actually governed and administered by Christians. Churches and clubs have been opened at Tashkend, Khodjend, Samarcand, and Bokhara, and in the first-named place a newspaper is published.

Two languages are spoken in Bokhara, the Persian and the Turkish—the former by the Tadjicks, the inhabitants of the towns, and the better instructed and richer portion of the Uzbeks. The Turkish language is general among the Turcomans, Kirghis, and nomadic Uzbeks.

The trade between Bokhara and Russia is of considerable value. The imports are broadcloths and nankeens (which are preferred to those of English make on account of their durability, though the greater cheapness of the English is gradually bringing them into use), iron and copper manufactures, and furs; the exports are raw cotton, cotton thread, lamb-skins, turquoises, and lapis-lazuli; the raw cotton, which is of short staple, is chiefly employed for candle wicks in the large candle manufactories of Ekaterinburg. To Persia are sent black lamb-skins and Kermani shawls, which in Bokhara have nearly superseded the Cashmere shawls. Between British India and Bokhara the trade goes by Peshawur, through Khyber and other passes of the Sulman Mountains. The principal items of import are cotton, woollen and silk goods from England and India, coarse country cloths and sugar from the Punjab, and indigo from Multan and Hindustan. The exports are raw silk and silk fabrics from Bokhara, gold and silver wire (real and imitation) from Russia, horses and ponies from Turkestan, almonds and raisins from Cabul, and bullion. ("History of Bokhara," by A. Vambéry, London, 1873.)

BOKHARA, the capital of the khanate of the same name, is in 39° 48' N. lat., 64° 26' E. lon., in a level country, surrounded by gardens, which render it impossible to see it except at a small distance. It is from 8 to 9 miles in circumference. Bokhara is of a triangular shape, and inclosed by a wall of earth about 24 feet high, and as wide at its base, but only 4 feet wide at the top. In this wall there are twelve gates, built of bricks, with a round tower on each side. The widest street measures about 7 feet in width, and the narrowest only 3 or 4. The houses are built of sun-dried bricks on a frame-work of wood, and are all flat-roofed. They are arranged in the Oriental manner, presenting towards the street a mere wall without windows, with a gate in the middle leading to a court-yard, round which the rooms are placed, which generally receive the light through the doors. The town is intersected by canals, which receive their water from the river Zarafshan, which is 6 or 7 miles from the town. It is afterwards distributed to sixty-eight wells, or rather cisterns, each about 120 feet in circumference. The palace of the khan stands on a hill, about 200 feet high, having the form of a truncated cone; it comprises not merely the royal buildings, but the offices of the vizier or prime minister. The mosques amount to over 300.

Since the entrance of the Russians in 1868, the general appearance of the town has considerably altered. It has a busier and more commercial aspect. Visitors and merchants from foreign parts move freely about where formerly a Christian only dare to venture in disguise, chanting Moslem hymns; while the melancholy monotony of the muezzin's chant is broken by the cheerful sounds of the bells of the Greek churches.

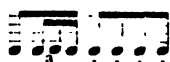
Bokhara contains a greater number of colleges, called *medreses*, than any other Mohammedan town of equal size. The medreses have considerable revenues, the whole of the bazaars and baths of the city having been erected by pious persons, and left for the maintenance of the medreses and mosques. The public baths and the caravanserais are both numerous. The great square, or Segistan, is mostly occupied as a market, but it has also numerous tents used as shops. As the duties levied on merchandise are but small, and as Bokhara forms an admirable centre for commercial operations, the Segistan is attended by merchants from a great variety of countries.

The Tadjicks compose by far the greater part of the inhabitants, amounting to three-fifths of the whole. They are merchants, manufacturers, and artists. The number of Jews and Hindus settled at Bokhara is considerable, and there are also representatives of numerous European business houses. The dealings of the inhabitants are very extensive; for there are six commercial routes radiating from Bokhara. One of these leads to Samarcand, Kheikand, and Kashgar; another to Khiva and Astrakhan; a third through the Kirghis region between the Sea of Aral and the Caspian; a fourth to Meiv and Meshed; a fifth to the Oxus and Herat; and a sixth to Balkh, Khulm, Bamian, and Cabul. Most of the commodities of Asia and Europe find their way along one or other of these six routes, and give rise to an active commerce at Bokhara. The population of the city was estimated in 1873 by Vambéry, who gives a good description of it in his "History of Bokhara," at 70,000. In the days of its former greatness "Bokhara the Noble" contained upwards of 200,000 inhabitants, but at present the diminished number of 70,000 has a tendency still further to decrease, owing to the gradual loss of water from the upper Zerafshan, which is being drawn off in ever-increasing quantities by the Russians for the irrigation works of Samarcand.

BOLAN PASS. See AFGHANISTAN.

BOLE is the term applied to an earthy mineral which somewhat resembles clay, and occurs in amorphous masses in various countries, as in Armenia, Saxony, Tuscany, Siena, Ireland, and the Isle of Skye. It is a hydrated silicate of aluminium, in which the alumina is partly replaced by oxide of iron and partly by lime. The colour of bole is various, either yellow, brown, red, or brownish, and pitch black; it is dull, has a greasy feel, and adheres to the tongue. Its fracture is conchoidal, yields to the nail, and the streak is shining. The chief varieties are the Armenian and the Lemnian bole. They are used to a small extent as pigments, and also in medicine, but not to so great an extent as formerly. The tonic properties for which bole was formerly administered were due to the oxide of iron, now obtained in a purer condition.

BOLE'RO, a highly characteristic and stirring Spanish dance measure in triple time, practically identical with the Cachuen. It represents musically a favourite rhythm of the castanets, which are an almost inseparable accompaniment of this dance.



The above is a very usual variety. Modern musical composers, almost without exception, have written in this fascinating measure; Auber, Weber, Bizet in opera, and Chopin for the pianoforte, are amongst the most successful. The

dance itself, as seen amongst the Spanish gypsies, is the most coquettish and charming performance possible. The dancer sings and accompanies herself with the castanets, perhaps assisted with a guitar or two by the bystanders, and expresses vividly every varying phase of emotion by voice and gesture.

BOLETIC ACID, an acid obtained by Braconnot from various species of *Boletus*, and also called tungic acid. It is now considered to be identical with fumaric acid.

BOLE'TUS, an extensive division of *FUNGI*, of the natural division Hymenomycetes, subdivision Polypores, consisting of leathery masses, which are sometimes of considerable thickness, and having the spores lodged in tubes which occupy the same situation as the bills of the common mushroom, and are separable from one another and from the cap.

These fungi are generally found growing on the ground in woods and meadows, especially in pine woods. Several species are eatable, as *Boletus edulis*, *subtomentosus*, and *granulatus*; others are acrid and dangerous. *Boletus edulis* is known by its large size, 5 or 6 inches across; its smooth, brownish cap; its minute tubes, at first white, then turning yellow and green; and especially by the delicate network of pinkish lines on the stem. The flesh of the unwholesome Boleti turns blue when exposed to the air. The months of the tubes of poisonous kinds are red.

BOLEYN, ANNE (or more properly *Bullen* or *Bol-hyne*), was the daughter of Sir Thomas Bullen, afterwards created Viscount Rochford and Earl of Wiltshire. Anne's mother was Lady Elizabeth Howard, daughter of the Duke of Norfolk.

Anne Boleyn was born in the year 1507, and in her childhood accompanied Mary, the sister of Henry VIII., to France on her marriage with Louis XII. She remained in the court of that queen and of her successor, the wife of Francis I., for many years. She was afterwards attached to the household of the Duchess of Alençon. The time of her return from France is doubtful, but Burnet places it in 1527, when her father was sent on an embassy to France. At that time she became a maid of honour to Queen Katharine, the wife of Henry VIII., and was receiving the addresses of Lord Percy, the eldest son of the Duke of Northumberland.

Henry became attached to her immediately on her return. All his children by Katharine (his brother's widow, whom he had been forced to marry by his father Henry VII., in order to save the return of her dowry to the King of Spain) had died, one after the other, except a sickly girl, the Princess Mary; and there were great and legitimate fears lest there should be a civil war of succession. On the plea of scruples of conscience as to the lawfulness of his marriage with his brother's widow, Henry commenced proceedings for obtaining a divorce from Katharine, during the early part of which Anne retired to the country, but she kept up a correspondence with him by letter. In 1529 she returned to court, and was known to be intended by Henry for his future queen.

In the meantime the king's divorce from Katharine was retarded by various delays; and at the beginning of the year 1533, tired out by the prevarications of Pope Clement VII., who sought refuge in postponements from the threats of Henry on the one hand, and of the Emperor Charles V., Katharine's nephew, on the other, Henry married Anne Boleyn secretly, in the presence of her uncle, the Duke of Norfolk, and of her father and mother. The king, who three years before had disgraced Wolsey for Anne's sake, now determined to break with the authority of the pope, and a swift series of reforms by his new minister, Thomas Cromwell, created the Church of England. Cranmer, an ardent Protestant, was made Archbishop of Canterbury, and ordered at once to try the question of the king's first marriage, which yet remained unsettled at Rome. It was

not until the 23rd of May following that the nullity of the king's marriage with Katharine was declared by Crammer, who five days afterwards confirmed that of Anne Boleyn; and on the 1st of June Queen Anne was crowned with great pomp. On the 13th of the following September the Princess Elizabeth was born.

Of the events of the queen's life during the two subsequent years little is known, except that she favoured the Reformation and promoted the translation of the Bible. In January, 1536, she brought forth a dead child, and it was at that time and during her previous pregnancy that the affections of her husband were alienated from her, and fixed upon Jane Seymour, daughter of Sir John Seymour, and one of the maids of honour to the queen. Queen Anne was now accused of criminal intercourse with her brother, Viscount Rochford, and others. On very doubtful and untrustworthy evidence she was found guilty. Two days after she was condemned to death Crammer pronounced the nullity of her marriage.

In the interval before her death, while confined in the Tower, she firmly maintained her innocence, and addressed a touching and apparently quite sincere letter, a copy of which is now in the British Museum, to the king, setting forth her guiltlessness. On the 19th of May she was executed on the green before the Tower, denying her guilt, but speaking charitably of the king, no doubt with a view to protect her daughter from his vengeance. Her body was thrown into a common chest of elm tree, used to put arrows in. Lord Rochford, Norris, Weston, Biereton, and Smeton, accused with her, were also put to death.

BOLI or **BOLY**, a town in Anatolia, Asiatic Turkey, is situated 85 miles N.W. of Angora, on the Philius Chai, on the caravan route between Constantinople and Erzerum. It has mineral baths, the ruins of a castle, and several mosques. It is the seat of a governor, and the capital of a sanjak. Population, 5000. Boli is said to be near the site of the ancient city of Hadrianopolis.

BOLINGBROKE, HENRY ST. JOHN, VIS. COUNT, was the son of Sir Henry St. John, Bart. of Battersea, where he was born 1st October, 1678. His mother was Mary, daughter of Robert Rich, earl of Warwick. In 1700, soon after his return from a sojourn on the Continent, he married and came into the possession of considerable property. His wife and he, however, could not agree, and they soon parted.

He had before this produced a few short poetical pieces of little merit, but he was chiefly known as one of the most dissipated among the young men of fashion of the day. He now, however, entered into politics. He attached himself to the Tory party, and was already the intimate friend of Harley, afterwards Earl of Oxford. He sat in Parliament for the family borough of Wotton Bassett from 1701 to 1708, and was secretary at war from 1704 to 1708, till the formation of a Whig administration under Marlborough and Godolphin.

The dismissal of Godolphin, in August, 1710, again elevated the Tories to power, with Harley at their head, and St. John was withdrawn from a studious retirement to be made one of the secretaries of state. In the new Parliament he sat for the county of Berks.

Of this memorable Tory administration St. John was one of the leading members. During its tenure of power it had terminated by the disgraceful peace of Utrecht (1713) the war with France, which had lasted since 1702. It dismissed and degraded the great Duke of Marlborough, who had made the war of the Spanish succession for ever memorable to Englishmen. In the negotiations by which the peace was brought about, St. John bore the chief part. Macaulay, in his trenchant way, characterizes "Harley as a solemn tiffler, and St. John a brilliant knave" (Essays); not without reason, for both he and Harley, from their first entrance upon office, contemplated the restoration of

the Stuart family to the throne, if circumstances should prove favourable for such an attempt. He had been called to the House of Lords by the title of Viscount Bolingbroke in July, 1712; and soon after this, from various causes, an estrangement arose between him and his old friend Harley, now Earl of Oxford and lord treasurer. Through the aid of Lady Masham, Bolingbroke was enabled to effect the removal of his competitor on the 27th of July, 1714.

The death of the queen, however, which followed within a week, and the prompt and decisive measures taken at the instant by the friends of the House of Hanover, made Bolingbroke's triumph only that of a moment. He was dismissed from his office on 28th August, and though he appeared and even spoke in the House of Lords under George I., he became so alarmed by the temper shown by the new House of Commons, which had commenced its sittings on the 17th of March, 1715, that on the 25th of the same month he left London in disguise, and succeeded in making his escape to France. On the 9th of August following, by order of the Commons, he was impeached by Walpole at the bar of the House of Lords of high treason and other high crimes and misdemeanours, and attainted by Act of Parliament on the 10th of September. In the meantime he had entered into the service of the Pretender, who appointed him his secretary of state or prime minister, but this did not last long. At the end of the year the prince suddenly dismissed him from his employment, and had him formally impeached before what he called his Parliament for neglect of the duties of his office. Bolingbroke now endeavoured to make his peace with the court of St. James', in consideration of the services he might now be able to render against the party and the cause by which he had just been flung off, but the ministry declined granting the pardon for the time.

He remained in exile for the next seven years, during which he kept up a correspondence with Swift, Pope, and other literary friends in England. He resided principally on a small property called La Source, near Orleans, which he had purchased in 1719. His wife having died in November, 1718, in May, 1720, he privately married the widow of the Marquis de Vilette, a niece of Madame de Maintenon, who brought him a considerable fortune. In May, 1723, he obtained liberty to return to his own country, principally, it is understood, through the intervention of the king's mistress, the Duchess of Kendal, whom Lady Bolingbroke bribed with a sum of £11,000. In 1724 Bolingbroke came to reside in England, at Dawley near Uxbridge, and successfully petitioned for the restoration of his property; but he could not obtain the complete reversal of his attainder, the operation of which still excluded him from the House of Lords. The doors of Parliament thus shut against him, he engaged in a course of active opposition to the Walpole ministry through the medium of the press; and his political papers, published first under the title of the "Occasional Writer," and afterwards continued in the *Craftsman*, excited for some years much attention. It was in the *Craftsman* that the series of papers from his pen originally appeared which were afterwards collected and published separately under the title of "Letters upon the History of England, by Humphrey Oldcastle," and also the subsequent series of letters forming his "Dissertation upon Parties."

In 1735 he returned to France, again taking up his residence in England in 1742 at Battersea, where he remained till his death, 15th December, 1751.

Bolingbroke's works, including the unpublished essays, &c., appeared, in five vols. 4to, in 1754. In 1798 there appeared in two vols. 4to (sometimes designated the sixth and seventh volumes of Bolingbroke's works), "A collection of the Letters and Correspondence of Bolingbroke, Public and Private, during the time he was Secretary of State to Queen Anne, &c.," edited by Parke. The well-known

didactic poems of Pope are inspired by his brilliant friend Bolingbroke; they are the essays in verse. Cooke's "Life" (London, 1835), and Macknight's "Life" (London, 1863), are good accounts of Bolingbroke's career; but Swift's "Journal to Stella" is indispensable to the reader desirous of knowing the best side of this remarkable man as portrayed by his intimate friend. The signature of Bolingbroke is included in our Plates of AUTOGRAPHS.

BOLIVAR, SIMON, was born in Caracas on the 24th or 25th July, 1783. He was sent, when about fourteen, to Madrid for the completion of his education. After remaining several years in Madrid, and paying some attention to the study of jurisprudence, he made the tour of Italy, Switzerland, Germany, England, and France; and after a long residence at Paris he returned in 1802 to Madrid, and there married, his age being then nineteen, and that of his wife sixteen. In 1809 he returned to his native country, and retired with his wife to domestic seclusion on one of his patrimonial estates in the beautiful vale of Aragua near Caracas, where his wife almost immediately died of the yellow fever. To alleviate his grief he returned to Europe. From Europe he proceeded to the United States, where he gathered some useful political knowledge, and about the beginning of 1810 again landed in Venezuela, in company with General Miranda, and retired to his estate of San Mateo.

In the first revolutionary movement in South America Bolivar does not appear to have taken any active part, but soon after its outbreak he accepted the proposition to proceed to England, for the purpose of soliciting the British cabinet to aid the cause of the Independent party, and, with Don Luis Mendez, arrived in London in June, 1810. Finding that the English government professed to maintain a strict neutrality, Bolivar, after a short stay in England, left his companion and returned in disgust to Caracas. Upon the appearance of Miranda as commander-in-chief of the "patriot" army in 1811, Bolivar was appointed colonel in the Independent army, and governor of Puerto Cabello, the strongest fortress in Venezuela. He fought under Miranda in several engagements with the Spaniards, in which the Independents were successful, until July, 1812, when Puerto Cabello was taken by the Royalists, and General Miranda surrendered to Monteverde. Venezuela was now again entirely in the hands of the Royalists, and deeds of revolting ferocity and plunder reduced the whole country to a frightful state of misery. On pretexts the most trivial old men, women, and children were arrested, maimed, and massacred as rebels. It was now, on reflecting upon these atrocities, that Bolivar became a more enthusiastic convert to the patriot cause, and with his cousin Ribas proceeded from the island of Curaçoa to Carthagena, in order to raise a liberating army. There, by the influence of Manuel Torres, the republican president of New Granada, about 800 men were fitted out; and Castillo, the president's cousin, having joined with 500 more, in January, 1813, Bolivar as commander-in-chief, and Ribas as major-general, undertook to drive the Spanish Royalists from Tenerife, on the river Magdalena. Having succeeded at Tenerife he advanced in December to Mompox, in January, 1813, to Ocaña, and in February to Cucutá, whence he expelled the Spanish commander Correa. With this encouragement he planned an expedition for the relief of Venezuela, after first proceeding to Bogotá, where the Congress of New Granada received him well, and added largely to his means. The war now continued with varying success to each party. The Spanish generals, Boves, Rosette, and Morales, exercised the greatest cruelties, and the reprisals were of an equally barbarous and sanguinary nature. On General Morillo arriving from Spain with an army of 12,000 men in April, 1815, Bolivar withdrew first to Jamaica and then to Hayti. Landing again in Venezuela in 1817 he succeeded in defeating Morillo in several battles, and on the

15th February, 1819, a solemn installation of the congress of the Venezuelan Republic was made at Angostura. His authority as supreme chief, though resigned into the hands of the congress, was continued to him under the title of President, until the more violent commotions of society should subside, and the enemy be utterly expelled. In the same year he marched to the assistance of General Santander in New Granada, and in July arrived at Tunja, which, after a daring and well-planned engagement on the neighbouring heights of the Andes, he took from the Royalists; and on the 7th of August a decisive victory at Boyacá, in addition to several others, at once gave him possession of the whole of New Granada.

Morillo having returned to Spain in June, 1821, his successor, General La Torre, was totally defeated by Bolivar at Carabobo, near the city of Valencia, on 21st June, 1820, when the Royalists lost above 6000 men, with all their artillery and baggage. This decisive battle concluded the war in Venezuela. The remnant of Spanish troops who escaped to the fortress of Puerto Cabello were compelled to surrender to General Paez. Bolivar entered the city of Caracas in triumph, a republican constitution was drawn up, and adopted on the 20th of August, 1821, decreeing that its arrangements should continue until 1834. Colombia was now cleared of the Royalist troops, except the province of Quito, which was liberated by the great victory of General Sucre on the 24th of May, 1822, at Pichincha, one of the mountains of the Chimborazo overlooking the city of Quito. It was still deemed expedient, for the sake of security to the southern frontier of New Granada, to deprive the Spaniards of their possessions in Peru, and General San Martín, the founder of Peruvian independence, having solicited Bolivar to assist in the final struggle, he left the administration of government to the vice-president, General Santander, and putting himself at the head of the Colombian army at Popayan marched to Pasto, and thence to Guayaquil, where, on the 26th of July, 1822, he had an interview with San Martín, and then embarked his troops for Callao. On the 1st of September he entered Lima. The Royalists on his approach evacuated the city; and the inhabitants, with every demonstration of delight, received him, and gave him the command of all the country's resources for the completion of its liberation. A republican constitution was adopted on the 13th of November, 1823, by a congress from the provinces of Northern or Lower Peru, of which Lima is the capital.

The congress, unable to govern, in February, 1824, dissolved itself, and appointed him dictator. Notwithstanding the efforts of an active faction, who accused him of having views of personal aggrandisement, he succeeded in defeating the Royalists on the plains of Junin in August, 1824, and on 9th December in the same year at Ayacucho. On 10th February, 1825, the congress was again convoked by Bolivar, who resigned the dictatorship. He set out in company with Generals Sucre and Miller on the 10th of the following April to visit the provinces of Southern or Upper Peru, and proceeded to Arequipa, Cuzco, La Paz, and Potosí. In January, 1826, he returned to Lima, and on the 25th of the following May the famous Bolivian code was presented to the Congress of Bolivia, by which it was adopted, though not without partial dissatisfaction, on the 9th of December, 1826, the anniversary of the battle of Ayacucho, and General Sucre was appointed president. It was soon afterwards adopted by the Congress of Lima, where Bolivar himself was made president.

In Colombia his long absence had occasioned the prevalence of much disaffection and party strife. Suspicious arose as to the intentions of Bolivar, and these soon produced a civil war, at the head of which was General Paez, who was at length declared president of Venezuela, a separate republic, and a declaration, signed by 186 leading men of Caracas, the scene of so many of Bolivar's splendid

triumphs, denounced his ambition, and rejected his authority. Under these circumstances a general convention, in January, 1830, was held at Bogotá, in order to frame a new constitution for Colombia. The proceedings were opened by Bolívar, who, in a solemn address, offered his resignation; but this, as on former occasions, was not accepted. He had, however, finally determined to take leave of public life, and retired to Carthagena, broken down and exhausted in mind and body. Joachim Mosquera had been some time before solicited by Bolívar to become the president; he now accepted the office; but after a few months he resigned, in despair of controlling the fierce contentions of the numerous aspirants to power. Bolívar, who had determined to take leave of his country and retire to Europe, was again importuned to come forward, but declined in consequence of failing health.

In December, 1831, he sent to the people of Colombia a farewell address, in which he vindicated his conduct, and bitterly complained of calumny and ingratitude. A week after the writing of this address he expired at San Pedro, near Carthagena, on Friday, the 17th of December, 1831, at the age of forty-eight. It is said that in his last moments he confessed to all the rites of the Catholic religion, that he manifested great calmness and resignation, and constantly showed the utmost anxiety for the prosperity of his country. His property was mainly devoted to the service of his fellow-countrymen, and he has been well designated the Washington of South America. Like many other great men, he was rightly estimated after his death. By a resolution of the Congress of New Granada in 1842, his ashes were removed from Santa Marta to Caracas, where a triumphal arch was erected to his memory.

BOLIVIA is the name adopted by one of the republics formed in South America. It was originally called Upper Peru, and formed a portion of the viceroyalty of Buenos Ayres, or De la Plata, but it became independent of Spain in 1824. Bolivia extends from 9° to 23° S. lat., and from 57° 30' to 70° 39' W. lon. Its mean length is 700 miles, mean width 300 miles, and area 375,000 square miles. It is bounded on the W. by Peru and for 200 miles by the Pacific, on the N. by Peru and Brazil, on the E. by Brazil and Paraguay, and on the S. by the Argentine Republic and Chile.

As nearly the whole of this country is situated within the tropics, it might be expected that its climate and productions would correspond to its geographical situation; but perhaps not more than one half of its surface has a tropical climate. The other half is occupied by high mountain ranges, table lands of great elevation, high valleys, and widely extending slopes. This mountainous portion of Bolivia belongs to the great range of the Andes. West of the Andes, running from S. to N., enter Bolivia they send off, at about 24° N. lat., a branch to the E., which extends to a great distance, and separates the affluents of the Rio Beni from those of the Pilcomayo, both of which fall into the Paraguay on its right bank. The main chain extends northward, and about 20° S. lat. divides into two main chains; these two, together with the intermediate valley of the Desaguadero, occupy a breadth of upwards of 200 miles to the N. of 18°, but to the S. of that part they are upwards of 300 miles in width. The length of this mountain mass is about 420 miles, and consequently covers a surface of upwards of 100,000 square miles, of which, however, not only one fourth belongs to the republic of Peru. It contains the highest peak of the Andes (Nevado de Sorata, 25,250 feet high), and several other peaks exceeding 20,000 feet in height. The valley of Desaguadero, 13,000 feet above the level of the sea, not having any outlet towards the sea, the rivers which descend into it are either lost in the sandy soil or empty themselves into the Lake of Titicaca, or Chuquibato, at its northern extremity. This lake, the largest in the South American

continent, occupies an area of about 4600 square miles, and its surface is 12,795 feet, or nearly 2½ miles, above that of the Pacific. In some places its depth has been ascertained to be 120 fathoms, but many parts are probably much deeper. The only outlet of the Lake of Titicaca is the river Desaguadero, which issues from its S.W. extremity, in lat. 16° 38', and is a small stream when compared with the immense extent of the lake. The lake contains numerous small islands, which rise directly from the water's edge to a considerable height. That from which it has taken its name, and which is known in the history of the ancient Peruvians as the place where Manco Capac made his appearance, is situated at the S.E. extremity. The river Desaguadero might be made navigable at a small expense for light-draft steamers from Lake Titicaca to its confluence with the Mauri river, and this would give much greater facilities for the transit of goods through this barren region. It is, however, obstructed by sandbanks, and part of its waters are absorbed below its junction with the Mauri. Lake Poopó, another large lake on this table-land, is chiefly surrounded by low flat lands, and a very slight rise in its waters is sufficient to overflow large tracts of country. At its southern extremity the lake has an outlet, the Laca-Ahuina river, which, after flowing underground, at length reaches the Salinas de Ceipasa. These Salinas, of which there are several, are great plains of salt of dazzling whiteness, and whilst dry enough at times to be crossed, are in the wet seasons quite impassable, the ground being then not only very soft, but often 2 or 3 feet under water.

The climate of the valley of Desaguadero, on account of the elevation, is never overheated. From November to April much rain falls, but from April to November the air is dry and clear. There are no trees in the valley, but it produces many varieties of plants. European corn-plants do not ripen here. The guanaco, the alpaca, the vicuña, are met with in the valley. Rushes grow abundantly, and are used for the same purposes as the bamboo in India.

That portion of Bolivia which extends between the Andes and the Pacific, in length upwards of 250 miles between the Bahía de Nuestra Señora and the small river Loa, is mostly a line of sandy desert interspersed with lofty sand-hills, and intersected with streams and rivers. On the banks of these rivers are the only inhabited places. The rivers are greatly swollen in the rainy season, but in the dry season many of them are absorbed and stopped by the sands. There are six mountain passes, at an elevation of not much less than 15,000 feet, over the Andes from this strip of sea-coast to the central part of Bolivia. This central part consists of a mountainous region and a series of plains; the mountainous region is composed of offshoots from the Andes, separated by valleys which are in some instances extremely beautiful and fertile.

No part of America has a greater abundance of water than this region; the rivers which descend from the eastern declivities are very numerous, and contain a volume of water which cannot be exhausted by irrigation. These rivers may be considered as the true sources of the Amazon and La Plata rivers, being at a greater distance from their mouths than any other streams. The chief among them are the Madera, the Beni or Paro, the Mamore, the Caca, the Chuquapico, the Quetoto, the Mapiri, the Cochabamba, the Rio Grande, the Chaparé, the Itanez, the Yacuma, the Uchay, the Pilcomayo, the San Juan, the Paspaya, and the Carhynao. Some of these rivers are of great magnitude, and carry down an immense volume of water from the Andes to the Amazon and La Plata. The Beni river has been discovered to be navigable for large steamers for a distance of 500 miles from its mouth, and for small craft for 300 miles further.

The whole eastern portion of Bolivia, from the banks of the Pilcomayo and the frontier of Buenos Ayres to the junction of the Mamore and Beni, is one extensive plain,

which from E. to W. extends about 200 miles, and from S.E. to N.W. upwards of 700. The rivers which traverse it in the rainy season, from October to April, inundate the country along their banks to a considerable extent. In many places there are lakes, and though none of them are very large, the exhalations, united with those from the inundations, render the climate excessively humid. This humidity, added to the heat which prevails all the year round, gives rise to many dangerous diseases, and renders the plain very unhealthy, especially for Europeans. This part of the republic has consequently been almost abandoned by the Creoles, though its great fertility would better repay the labour of the cultivator than any other district of the country. Immense forests of high trees cover nearly the whole of these plains. The plantations consist commonly of mandiocca and maize, those of cotton and rice being rare; all the other tropical productions which might be cultivated with the greatest advantage are almost entirely neglected. Here, as in the high valley, the summer is the rainy season. It is free from the hailstorms, thunderstorms, and earthquakes which frequently visit the higher regions. Some of the regions beyond the confines of this plain are very fertile, and produce most of the fruits, grain, and agricultural crops of temperate climates, as well as many of tropical growth.

Besides the animals peculiar to the valley of the Desaguadero, there are the tapir, the jaguar, the leopard, six or seven sorts of monkeys, and several amphibious creatures found in Bolivia. Of domestic animals there are horses, asses, and mules, but for sheep the climate is too warm. Great herds of horned cattle find abundant pastures on the banks of the rivers in the plains. Of birds some are familiar in England, while others are met with only in America. The fish are abundant. The mineral riches comprise gold, silver, copper, lead, tin, saltpetre, sulphur, and salt. There are also large guano deposits at Mejillones.

The inhabitants of Bolivia are composed of aborigines and of people of foreign extraction. The aborigines form by far the greater portion of the population; they are divided into a great number of tribes, most of which have been converted to Roman Catholicism, though some of them retain ceremonies of their ancient religion. Those of them who have been brought most in contact with Europeans have made the most advance in civilization, but they are for the most part a very rude people. The inhabitants of foreign extraction are either the descendants of Spaniards or of Africans and the mixed races. The descendants of the Spaniards are most numerous in the mining districts and in the valleys of the Cochabamba and Cacha Pileo, where they may be said to compose the great bulk of the inhabitants; they are much less numerous on the coast and in the valley of the Desaguadero, and their number in the plains is very small. The people of pure African blood are few in number, but the mixed races, which owe their origin to a mixture with negroes, are numerous on the coast, much less so in the mining districts, and in other parts very few of them are found. Like the natives of most mountainous and inaccessible regions, which are, as a rule, less exposed to the innovating tendencies of civilization, and consequently are more tenacious of the ancestral habits and customs, the lower classes in Bolivia, and in the smaller townships even many well-to-do families, prefer the Quichua, or old Inca language, to the Spanish, both in business and social intercourse.

The republic of Bolivia is politically divided into the following nine departments:—La Paz, Potosí, Oruro, Chuquisaca, Cochabamba, Berri, Santa Cruz de la Sierra, Tarija, and Atacama. A careful estimate made in 1883 in the several ecclesiastical divisions of Bolivia showed the population to be 2,300,000. No country perhaps is under greater disadvantages with respect to commercial intercourse with foreign countries than Bolivia. The part which is

contiguous to the coast is a sandy desert, which produces nothing fit for a foreign market, and it is separated from the rest of the country by a chain of high mountains up to the parallel of Potosí. As a result of the war with Chili in 1879–80 Bolivia ceded to that country all her coast territory. Until recently the vast agricultural and mineral resources of the country were almost entirely dormant from these causes, nearly all internal trade being carried on by packhorses and mules; but successful attempts have been made by English engineers and capitalists to construct roads, and several lines of railway have been planned and sanctioned by the government. One short line was opened in 1872, another in 1874. The completion of several other lines in course of construction was abandoned in 1879, in consequence of the war with Chili. The chief industry of the country is at present cotton spinning. The imports are mostly confined to iron, hardwares, silk, and a few other articles; and the exports to the precious metals, copper, wool, cinchona bark, skins, and guano. The value of the imports from Bolivia to the United Kingdom in 1881 was £246,637, chiefly nitre and guano; the exports to Bolivia in the same year were valued at £51,264. The revenue is about £700,000 per annum; the expenditure is considerably in excess of that amount. There was in 1885 a national debt of £6,000,000.

Bolivia formed, previously to the battle of Ayacucho in 1824, a part of the Spanish viceroyalty of Buenos Ayres. The Republicans, under General Sucre, having then defeated the Royalists, the independence of the country was secured. Its present name was given to it in 1825, in honour of the liberator BOLIVAR, who, on being requested, drew up a constitution, which was adopted the year following. Important alterations were, however, made in it in 1828, 1831, and 1863. By its present provisions the whole executive power is vested in a president, elected for a term of four years; while the legislative authority rests with a Congress of two chambers, called the Senate and the House of Representatives, both elected by universal suffrage. The president is assisted in his executive functions by a vice president, appointed by himself, and a ministry, divided into four departments—of the interior and justice, of finance, of war, and of education and public worship. The regular election, however, of the chief of the executive every four years has seldom been carried out: so the presidency of Grand Marshal Santa Cruz, who ruled Bolivia from May, 1828, till his death, 20th January, 1839. Subsequently the supreme power has been almost invariably seized by some successful commander, who, proclaimed by the troops instead of chosen by the people, has been compelled to protect his office by armed force against military rivals. In fact, a spell of violence and anarchy has brooded over the land since its first birth as an independent state, and it has lived for the most part on indifferent terms with its neighbours, the principal cause of its difficulties having been the coming and settling in circulation of a large quantity of base money. The chronic state of anarchy, and often of civil war, which distracted the country of course kept it far behind in the scale of civilization. Its laws were weak and corrupt, and the country, from its inaccessible position, seemed to rejoice in the privilege of doing wrong with impunity to all except its immediate neighbours. Education was totally neglected, and the morals of the press were lower than in any other South American state. Civil war, however, reached a sort of climax in 1839, and for the next few years Bolivia enjoyed a period of comparative tranquillity. It is but just to add that advantage was taken of these happier circumstances to carry out numerous much-needed reforms, amongst others the improved communications already referred to, by which the country may in course of time derive the benefit of its undoubted natural wealth. In 1880, however, Bolivia joined with Peru in an utterly unjustifiable attack upon

Chili, from which it came out beaten, discredited, crippled in resources, and burdened with a large addition to its national debt. Chuquisaca, or *Strake*, is the largest town, but the seat of the executive government, which had been for many years at the city of La Paz, was transferred in 1869 to the fortified town of Oruro. (*Statesman's Year Book*, London, 1883; "Eastern Bolivia and the Gran Chaco," a paper read before the Royal Geographical Society, 28th March, 1881.)

BOLKHOV', a town in the government of Orel, Russia, situated on the Nougra, about 30 miles N. of the city of Orel. It has a monastery, nunnery, and numerous churches, and manufactures of leather, gloves, hats, and hosiery, and a trade in hemp and linseed-oil. The town is built of wood, and is very ancient. Population, 20,000.

BOLLAND, JOHN (Bollandus), was born at Thienen (Tirlemont), 13th August, 1596. He entered the Society of Jesus at the age of sixteen, and became eminent in it as a teacher both in the Netherlands and other countries. He is chiefly known as having commenced, on Rosweid's plan, the "Acta Sanctorum," or "Lives of the Saints," a huge calendar giving the lives and deeds of each saint under the heading of the day set apart by the church in his honour. He died in great fame with his order and the Catholic world in 1665, having taken actual part in the publishing of eight folios of the work, and having directed and planned the whole gigantic undertaking. See BOLLANDISTS.

BOLLANDISTS. The Bollandist "Acta Sanctorum" form incomparably the best and completest collection of the lives of the saints. Both the series and the subject it deals with are of no slight interest and value from many points of view. M. Guizot has devoted to it a chapter of his "History of Civilization in France," and while observing that these saintly chronicles constitute the real literature of the first half of the middle age, nourishing at once its intellectual, moral, and æsthetic life, he adds—what is obvious—that "so great an activity and fecundity cannot certainly be due simply to the imagination of the authors, but must arise from general and powerful causes." M. Renan goes further; he reckons the continuation of the Bollandist series among the most serious and most beneficial characteristics of the Catholic reaction of the present century, and considers that "for a true philosopher a prison cell with these fifty-five volumes in folio would be a true paradise." Biographies or memoirs of good men, under whatever variety of form or designation, have always formed an important portion of the spiritual nutriment of pious Christians, Catholic and Protestant alike; even Foxe's "Martyrlogy" was a clumsy attempt to supply the want. As to the wonderful "fecundity" of the Bollandist collection, it may suffice to cite Guizot's astounding enumeration of 1472 saints for the single month of April, and his calculation that the fifty-three volumes published up to 1794 contained above 25,000 lives. And it must be remembered that even this vast number is but a selection, for the Bollandist editors chose out of the mass before them what they regarded as most noteworthy and trustworthy, and as of Catholic rather than only national interest. The idea of what is called the Bollandist series of "Lives of the Saints" ("Acta Sanctorum") originated not with Bollandus—who was, however, the actual founder of the company named after him, and editor of the earlier volumes—but with Heribert Rosweid, born at Utrecht in 1569, who in 1589 entered the Jesuit novitiate, and became a professor, first at Douai, and afterwards at Antwerp, and an enthusiastic antiquary. He published various works, one of which, the "Lives of the Belgic Saints" ("Fasti Sanctorum quorum Vitæ in Belgicis Bibliothecis Manuscriptæ"), was avowedly designed as a specimen of another and more comprehensive work embracing the lives of all the saints known to the church throughout the world. Rosweid had a European celebrity, and his scheme therefore attracted

the widest attention, and to the best judges seemed wholly impracticable. Cardinal Bellarmine asked whether he expected to live 200 years, for within no shorter space of time could such a work be worthily performed by one man. A longer period has, in fact, elapsed since its commencement, and the labours, not of a single man but of a whole literary society,* have as yet completed ten only out of the twelve months into which the series is divided. Rosweid himself did not live even to begin the actual composition of the work, though he had accumulated much precious material for it before he was carried off in 1629 by a contagious fever caught in the active discharge of his pastoral duties. The Jesuit Society accepted as a sacred and corporate bequest the undertaking he had planned, and at his death John Bolland, or Bollandus, well known at Antwerp as a preacher and confessor, was summoned to the task. Without abandoning his public ministry, he devoted himself assiduously to his new duties, working in two small dark chambers next the roof, exposed alike to the heat of summer and the cold of winter, in the Jesuit house at Antwerp. The great Benedictine monasteries, as well as his own order, gave him every help in their power, and thus a vast amount of fresh material was brought to light. In 1635 he wisely sought the assistance of a brother Jesuit, Godfrey Henschen, or Henschenius, who proved to be a man of much wider views as to the scope of the work than himself, and scorned the narrow limits within which his master would fain restrict himself. He boldly launched out into a discussion of all the aspects of his subject, discussing not merely the men themselves, but also the history of their times, and doing that in a manner now impossible, as the then well-stored, but now widely scattered, muniment rooms of the abbeys of Flanders and Northern France lay at his disposal. Bolland was so struck with the success of this innovation that he at once abandoned his own restricted ideas, and adopted the more exhaustive method of his assistant, which, of course, involved the extension of the work far beyond the sixteen volumes originally contemplated. The first two volumes appeared in 1643, and the next three, including the "Saints of February," in 1658.

The reigning pope, Alexander VII., who had been the lifelong friend and patron of Bolland, now pressed on him an oft-repeated invitation to visit Rome, and utilize the immense stores accumulated there and in other Italian libraries. He was too infirm to go himself, but he deputed Henschen and Daniel Papebroek, another assistant lately added to the company, to go in his place, and they spent two years and a half—from the middle of 1659 to the end of 1661—in the journey, travelling slowly through Southern Germany and Italy, and making an exhaustive examination of the various libraries on their route, which were thrown open to them in Catholic and Protestant cities alike, and where they were received with a cordiality and homage which turned their pilgrimage into a sort of royal progress. The greater part of 1661 they spent at Rome, where all ordinary restrictions on the free use of books or manuscripts were dispensed with in their favour by the pope. Four years after their return home, in 1665, Bolland died. He had himself worked at eight folios of the series; Henschen worked at twenty-four, Papebroek at nineteen, Janning, his successor, at thirteen. Other workers were Bosch, Suyskens, Hubens, and Berthod. The suppression of the Jesuit order in 1774 by Clement XIV. was followed in 1788 by the dissolution of the Bollandist company, when Godfrey Hermanns, abbot of Tongerlo in Brabant, bought their library, and for seven years continued the work, till it was brought to a close, at the fifty-third volume folio, by the wars of the French Revolution. Two ineffectual attempts were made to revive it—one in 1801, and a second in 1810, under the auspices of Napoleon; but in 1814 Pius VII. restored the Jesuit order, and at last, in 1838, four of its members—Boone, Vandermeere, Coppens, and Van Hecke—revived

the Bollandist company, and the work from that time forward has steadily advanced, under the patronage of the Belgian government. It is quite possible that the two remaining months of the "year" may be completed by the close of the century. Some idea of its general plan may be given. Bolland first of all arranged the saints of each day in chronological order, discussing them accordingly. A list of the names belonging to it is prefixed to the portion of the volume devoted to each separate day, so that one can see at a glance the lives belonging to that day and the order in which they are taken. A list then follows of those rejected or postponed to other days. Next comes prefaces, prolegomena, and "previous dissertations," examining the lives, actions, and miracles of the saints, authorship and history of the manuscripts, and other literary and historical questions. Then appear the lives of the saints in the original language, if Latin; if not, then a Latin version is given, while of the Greek "Menologion" which the Bollandists discovered during their Roman journey, we have both the Greek original and a Latin translation. Appended to the lives are annotations explaining any difficulties therein, while no less than five or six indexes adorn each volume—the first an alphabetical list of saints discussed, the second chronological, the third historical, the fourth topographical, the fifth an quonasticon or glossary, the sixth moral or dialectic, suggesting topics for preachers.

But, the reader may well ask, is there no general index, no handy means of steering one's way through this vast mass of erudition, without consulting each one of those fifty or sixty volumes? Without such an apparatus, indeed, this giant undertaking would be largely in vain; but here again the forethought of Bollandus from the very outset of his enterprise made provision for a general index, which was at last published at Paris in 1875. We possess also in Pottliast's "*Bibliotheca Historica Medii Ævi*" a most valuable guide through the mazes of the "*Acta Sanctorum*," while for a very complete analysis of every volume, joined with a lucid explanation of any changes in arrangement, we may consult De Backer's "*Bibliothèque des Écrivains de la Compagnie de Jésus*," t. v., under the name "Bollandus."

The Bollandists became involved in controversies with the Carmelites, Dominicans, and other rival communities of the Jesuits. Papebroek, e.g. ventured to challenge the alleged descent of the Carmelite order from Elijah the Tishbite, whereupon the Spanish Inquisition condemned the first fourteen volumes of the "*Acta Sanctorum*" as dangerous to faith, and the outraged Carmelites, after vainly invoking the aid of the King of Spain, induced Pope Innocent XIII. to impose silence on the disputants. The Dominicans later on had a fierce controversy with the Bollandists about the genealogy of their founder, St. Dominic. In such disputes the Bollandists generally had the best of the argument. It deserves, indeed, to be noted, considering how little credit the Jesuits have usually enjoyed for veracity, that in this matter the Bollandists, at least, appear to be quite above suspicion. These records will be found to supply fresh illustrations even of our English annals, discussing as they do very fully the lives of such English saints as Edward the Confessor and Wilfrid of York.

BOLOGNA, till 1860 a legation or province of the Papal States, now a province of the kingdom of Italy, is bounded E. by the province of Ravenna, N. by that of Ferrara, W. by Modena, and S. by the Apennines, which separate it from Tuscany. Its length from S.W. to N.E. is about 55 miles, and its greatest breadth about 30 miles. It is watered in its length by the Reno, the ancient Rhenus, which enters the Po near Ferrara, and by numerous torrents descending from the Apennines. The N.E. part of the province is very marshy and subject to inundations, and the S. part is mountainous; but the middle part is level, very

productive, and in a high state of cultivation. The lower hills also, and valleys of the Apennines, are well cultivated. Corn, wine, fruit, and all sorts of vegetables, hemp, flax, and silk are the principal products. Great numbers of cattle are reared. The population, including the city of Bologna, was 461,172 in 1882.

BOLOGNA (in Latin, *Bononia*), the chief city of the above province, is situated in a plain N. of the Apennines, and between the rivers Reno and Savona. A canal, navigable for large boats, connects Bologna with Ferrara, whence, by means of the Po, the Adige, and the intermediate canals, the water communication extends to Venice. The population of Bologna in 1882 was 121,579. The city is surrounded by walls, but is not fortified. It contains several splendid palaces, being the residence of many ancient families. The streets are tolerably wide, and most of them have low arcades on each side to shelter pedestrians from the rain. In the centre of the city are two lofty towers, the highest of which, called Asinelli, from the name of its founder, is 320 feet high, and is 4 feet out of the perpendicular; the other, Garisenda, is only about one-half the height of its neighbour, but inclines about 9 feet from the perpendicular. This inclination is caused by a depression of the ground under the foundations. Both towers date from the twelfth century. The Palace of the Podesta contains the archives of the city. In the square before the Palazzo Pubblico is a handsome fountain with a colossal statue of Neptune, by Giovanni da Bologna. Bologna abounds with churches, the total number being about 130. The principal are San Petronio, on the pavement of which is the meridian line traced by the astronomer Cassini; the Cathedral, which is dedicated to St. Peter; and San Domenico. The most singular church is that of San Stefano, which is really an agglomeration of seven churches of all sizes and styles, and of all ages from the fifth century down to the eighteenth. It is built on the site of a temple of Isis, whose beautiful marble pillars now adorn the Christian church.

The University of Bologna is the oldest, and is still one of the first, in Italy. Its origin is stated to have been under Theodosius II., and it is said to have been restored by Charlemagne. In the thirteenth century it had 10,000 students. The inscription on old Bologna coins, "*Bononia docet*," arose from its former distinction. In the year 1789 Galvani here made his great discovery which led to the foundation of the science of galvanism. It has the following faculties:—Theology, medicine, law, philosophy and mathematics, and belles lettres. For centuries ladies have been numbered amongst its professors. Annexed to the university are a museum, a botanical garden, an anatomical cabinet, and a library containing 200,000 volumes and 6000 MSS. Besides the library of the university, the city of Bologna has a public library which contains 83,000 volumes. The Academy of the Fine Arts has a splendid gallery of paintings, chiefly of the Bolognese school. The Istituto delle Scienze, founded by Count Marsigli, has an observatory. The Philharmonic Lyceum, in which 100 pupils are maintained at the expense of the town, possesses a valuable musical library of 17,000 volumes, collected by Father Marini, a great Bolognese composer of the eighteenth century. The Collegio Venturoli, founded in 1825, is devoted to students of architecture. There is also a college for Spanish students, founded by Cardinal Alberoni; and another for Flemish students, who are sent here by the Goldsmiths' Company of Brussels. There are several theatres, at which some of the best performers of Italy are generally engaged. There are more than 100 well attended public elementary schools, besides evening schools, the higher technical school, gymnasium, and the higher school for girls. The chief manufactures are hemp, silk, silks, crapes, paper, pottery, glass, chemicals, leather, macaroni, sausages, &c., and the city wears the appearance of being

one of the most thriving in Italy. Great improvements have of late years been carried out by the municipality; the town has been thoroughly well lighted and drained, and a very fine public domain (half garden, half park) was completed and opened in 1877. The richness of the soil around, and the good living for which the city has earned a reputation, have gained for her the title of "Bologna la Grassa." The city is connected by railway with all parts of Italy, and a fast extending commercial intercourse is carried on.

After a breach of 1600 years the aqueduct built by the Emperor Augustus to supply Bologna with water was restored to use in 1882. Nineteen hundred years ago the waters of the Setta, near its junction with the Reno, about 11 miles from Bologna, were brought to the city through an underground passage. The engineers followed the course of the Reno, tunnelling the hills, sinking their work beneath the beds of the precipitous torrents which rush from the mountains into the river, and bringing the waters to the gates of the city, where they were divided, one portion going to supply the public baths, and the other probably destined for the fountains of streets and public squares. The work of tunnelling the masonry was so thoroughly well done that both stonework and brickwork are still as solid as the rock itself.

Bologna has produced a greater number of distinguished men than any other city of Italy, except perhaps Florence. The most noted of these are Galvani, Marsigli (the friend of Newton), Aldrovandi, Mondino, Achillini, and Marcello Malpighi, naturalists and men of science; Manfredi, mathematician and engineer; the painters Guido, Domenico, the three Canaani, and others; eight popes and 100 cardinals.

Bologna is the seat of an archbishop; the series of its prelates ascends up to the fourth century. Outside of the walls the Campo Santo, or cemetery, contains many handsome monuments. On the hill called Della Guardia, about 3 miles from Bologna, is the handsome Church of La Madonna di S. Luca, which is joined to the town by a long arcade consisting of 635 arches. The once splendid monastery of S. Michelino-Bosco was sadly ruined during the French wars, and its treasures, by the Canaani and others, were nearly effaced by the soldiers.

Bologna was the pre-eminence of the Etrusci north of the Apennines, and was by them called *Felsina*. When the Gauls invaded Lombardy the Bolognese, one of their tribes, crossed the Po and established themselves in Felsina and the neighbouring country. Afterwards the Boii joined them, and the Gauls became one of Italy. After the second Punic war they, with other Cisalpine Gauls, were conquered by S. P. Nasica, and Felsina became a Roman colony, *colonia*. The Romans changed its name into *Bonaonia*. The Via Emilia was cutted from Ariminum through it. A fire destroyed great part of the city under Claudius (Tacit. *Ann.* xii. 58), when 10,000,000 sesterii were granted from the public treasury for rebuilding the town. On this occasion young Nepo pleaded before the senate in favour of Bonaonia (*Suet.* *Nero*, 7). In the third century a Christian church was built in the town, and dedicated to St. Felix; it was afterwards destroyed in the persecution under Diocletian. Bonaonia was spoiled with but little damage from the invasion of Avars and Attila. In the time of the Longobards a fourth part of the exarchate of Ravenna under the Eastern empire. Bonaonia was one of the towns alleged to have been given to the use of St. Peter by Pepin after his defeat of the Longobards. Under the Otthos of Saxony, Bonaonia and the other cities of North Italy obtained privileges and franchises as independent towns governed by their own municipal laws. The municipal independence of Bonaonia was acknowledged by the Emperor Henry V. in 1112, by a charter which conferred such advantages on the town that in a short time it obtained the rule over a great

part of Emilia, the country now called Romagna. In the war between Frederick I. and the Lombard League Bologna joined the latter. It likewise fought against Frederick II., on which occasion the Bolognese took prisoner Enzo, the natural son of the emperor, whom they detained in captivity till the time of his death. The factions of the Guelphs and Ghibelines proved the ruin of the liberties and independence of Bologna, as well as of the other North Italian cities. The Ghibelines who had been exiled from the city applied to Pope Nicholas III. for aid, offering to acknowledge him as liege lord of Bologna. The pope accordingly sent a legate to Romagna to restore peace to the province, and through his mediation the exiles were recalled. The pope was acknowledged protector and suzerain of Bologna. In 1331 the pope's legate was driven out of the city, and soon after Taddeo de' Pepoli, a wealthy citizen, was proclaimed lord. He used his authority with temperance and justice for twelve years, but after his death his two sons, unable to maintain their power, sold the town to the Visconti of Milan. The rule of the visconti was hard and cruel, and after several rebellions and reconquests Giovanni Bentiveglio, a citizen of Bologna, was made first magistrate in 1462, and he retained the office for forty-four years, under the nominal dominion of the pope. Giovanni, however, incurred the displeasure of Julius II., who took the city in 1506, and established the direct dominion of the church. In 1511 the sons of Giovanni, supported by the French, regained possession of Bologna, but after the battle of Ravenna, and the retreat of the French armies in 1512, the town surrendered to Pope Julius. It remained under the popes till June, 1796, when Bonaparte entered Bologna and drove away the Papal authorities. In 1797 it became the chief town of the Cispadane republic, and under the succeeding French kingdom of Italy was the capital of the department "Del Reno." The city was restored to the pope in 1815. In 1831 it made a successful effort to shake off the power of the pope, but was soon restored to him. In 1848 it again rose in revolution and even defeated the attempts of the Austrians to gain possession of it. When the Italian campaign of 1859 began it sided with the popular movement, and ultimately voted in the proportion of 1000 to 1 to be annexed to the kingdom of Italy.

BOLOGNA, GIOVANNI DA, or *John of Bologna*, a celebrated sculptor and architect, born at Douay in Flanders, about 1524. He went early to Rome, where he distinguished himself by his models of celebrated works. Though a Fleming, he is known only by the above name, which he seems to have acquired from his celebrated fountain in the Piazza Maggiore (now Piazza Vittorio Emanuele) at Bologna, of which the crowning colossal bronze figure of Neptune is one of the masterpieces of modern sculpture. It is said to weigh 10 tons, and to have cost 70,000 ducats. Several also of the noblest works in sculpture at Florence are by the hand of John of Bologna, two especially fine productions being the marble group of the "Rape of the Sabine Women," in the Loggia de' Lanzi, in the Piazza della Signoria; and the well known bronze of "Mercury" in the act of springing into the air, with one foot still upon a globe, in the gallery of the Bargello. This famous figure will be found amongst the Plates illustrating the article SCULPTURE. John of Bologna was one of the original forty members of the Academy of Florence, and also sculptor to the Grand-duke Francesco I. In 1580 he was invited to Genoa, where he executed several admirable works, chiefly in bronze. He died at Florence in 1608. John of Bologna is the sculptor who, when he showed to Michael Angelo, whilst at Rome, a carefully-finished model, was told by the latter to leave it sketch before he attempted to finish—a precept which he did not forget.

BOLOGNA PYRAL. In the manufacture of glass it is customary for the glass blower to test the quality of the pot metal by blowing a short thick flask, open at one end

and closed at the other. These vessels are not annealed, and as the more rapid cooling of the outside causes unequal contraction they possess some remarkable characteristics. If the closed end be struck with a hammer it will firmly resist the shocks, very great force being required to break it; but if a small angular bit of glass or stone be dropped into the open end, the vessel is shattered into pieces. These are sometimes termed Bologna phials from the place where they were first made, and sometimes philosophical phials from their peculiar qualities.

BOLOGNA, SCHOOL OF (in painting). The historians of the fine arts employ the word school, as it is often used in reference to other pursuits, only to denote a similarity of opinion, aim, or practice among many individuals; but the term is so far true to its literal import that the similarity of taste alluded to does not so much arise from the accidental coincidence of independent modes of thinking, as from some common influence, and generally from the example of one powerful mind. The object sought is frequently not so much a distinct manner as a refined eclecticism combining excellence not hitherto united in any one school. This was at least the professed object of the Caracci, the most celebrated among the Bolognese masters. It happens that this new effort took place in a school which had not before distinguished itself so greatly as the rest. The most brilliant epochs of art, south of the Alps, concur, the greatest masters having been contemporary with each other in the beginning of the sixteenth century. To this rule, which applies to Venice, Parma, Florence, and Rome, the Bolognese school is an exception, since it attained its comparative perfection nearly a century after the production of the finest works of Italian art.

The greatest painter of the first epoch was Francesco Francia. This artist, who was contemporary with Raphael, and survived him some years, according to Malvasia, was celebrated as a goldsmith and engraver of medals before he betook himself to the pencil at a comparatively advanced age. Vasari says that he was born in 1490, and that his first picture was dated 1490. He is celebrated as a painter who succeeded beyond most others in giving an expression of sanctity and purity to his Madonnas, and a letter of Raphael's is extant in which this merit is particularly alluded to. The school of Francia presents no distinguished names. The summit of the art had been already reached elsewhere, and his followers, who were inferior to him, were eclipsed by the disciples of Raphael. These introduced a more or less servile imitation of the style of their great model into Bologna. Only three names of any merit precede the epoch of the Caracci: Primaticcio, Niccolò dell' Abate, and Pellegrino Tibaldi.

Lodovico Caracci (1555-1619), who had studied in Venice, Florence, and Parma, conceived the plan of introducing a new eclectic style, alone and unassisted, and it is said that he persuaded his younger consins, Agostino and Annibale, to devote themselves to painting in order to aid him in effecting his purpose. The fame of these masters was firmly established by their works combining whatever was found to be excellent in the various schools then existing. The principles and practice of the Caracci and their scholars superseded for a time every other style in Italy.

Among the numerous scholars of the Caracci, Domenichino (Dom. Lampieri) holds the first rank. The brilliant talents of another scholar, Guido Reni, excited the jealousy of the Caracci from the beginning. Lodovico encouraged Guercino as a rival to him, and Domenichino was put forward, it is said, for no other reason, by Annibale Caracci in Rome. The light and silvery tone which is observable in some of Guido's best works is said to have been owing to an accidental expression of Annibale, who, at a time when the dark style of Caravaggio excited general attention, and was imitated, among others, by Guido himself,

remarked that the opposite treatment, with appropriate subjects, would perhaps be still more attractive. Caravaggio, who was born in the Milanese, and painted in Rome, Naples, and elsewhere, cannot be placed in the Bolognese school, which, however, he greatly influenced. Among the painters of the Bolognese school, Guercino, born at Cento, seems to have been most smitten with the vigorous effects of Caravaggio, although in his latest practice he acknowledged the charm of Guido's style by attempting to unite it, perhaps with little success, to his own. Lanfranco, born at Parma, and Albani (1578-1660) were other distinguished scholars of the Caracci.

Of their remaining disciples it may be sufficient to mention the names of Tiarini, Lionello Spada, and Cavedone. All the more noted scholars before mentioned had numerous followers, and perhaps none more than Guido. In the manner of the respective masters naturally degenerated, and no new talent arose. It may almost be said that the school died out with the brilliant followers of its founders the Caracci.

BOLOR or BELUR TAGH, a name given in some maps to a supposed extensive mountain range which was said to inclose the high table-land of Eastern Asia on the W., and separate it from the deep depression which surrounds the Sea of Aral on all sides, and the Caspian on three sides. It is now ascertained that no such range exists, but that there is a lofty plateau in its supposed position.

BOLSENA, a town in Central Italy, in the district of Viterbo, province of Rome, situated on the slope of a hill near the northern bank of the Lake of Bolsena, 56 miles N.N.W. of Rome, on the road to Florence. It is an old decayed-looking town, with 2726 inhabitants in 1882. Bolsena is near the site of the ancient Volturni, one of the principal cities of the Etruscans, which sustained several wars against Rome, and owing to its strong position, maintained its independence after the rest of Etruria had been conquered. In a revolt of the emancipated slaves against their masters it was, however, taken in 266 B.C. by M. Fulvius Flaccus, who razed the city to the ground. The inhabitants built themselves a new town in the new location. This new Volturni is little noticed in subsequent history. Segmus, the favourite of Tiberius, was a native of it. The Via Cassia passed through Volturni. Among the few remains of antiquity at or near Bolsena are some ruins of a temple, said to have been dedicated to the Etruscan goddess Nersia. The festival of Corpus Christi was established by Pope Urban IV. in commemoration of a miracle said to have occurred here. The appearance of drops of blood on the consecrated Host convinced a doubting Bolonian priest of the truth of the doctrine of transubstantiation. This happened in 1263, and is the subject of a picture in the Vatican by Raphael. The Cathedral of Orvieto was also built in commemoration of it.

BOLSENA, LAKE OF, near the town of Bolsena, is in shape nearly oval, and covers about 70 square miles. It is almost wholly surrounded by hills, which are covered with trees, vines, and gardens. South-west of the lake the country opens into the unwholesome plains which extend towards the sea. At this end the river Marta (Lates flumen) issues out of the lake, and after a course of about 40 miles enters the sea near Corneto. The lake is subject to overflows; it is in many places shallow near its borders, where it is covered with reeds, and frequented by multitudes of water-fowl. The air around it is unhealthy in summer. The lake abounds with fish and huge eels, which were celebrated in the time of Dante ("Purgatorio," xxx. 22). Two small islands rise out of the lake, Isola Bisentina and Isola Mattana. On the former island, Amalasuntha, queen of the Goths, only daughter of Theodoric the Great, was imprisoned (A.D. 534) before her murder by her nephew, the co-regent.

BOLSOVER, a village in Derbyshire, formerly a market-town, 23 miles N.N.W. from Derby, and 157 from London—being 6 miles distant from the Chesterfield station of the Midland Railway—is pleasantly situated, together with the castle (which is a modern erection on the site of the ancient Bolsover Castle), on a point projecting into a valley which surrounds it on every side except the N.E., where a separation has been made by a deep cut. There is an ancient parish church, which presents traces of various styles of architecture, from the Norman to a more recent time. The appearance of the church is somewhat spoiled by a mortuary chapel protruding from the main building. It was erected for the Cavendishes in 1618, and contains a Norman sculpture, in high relief, of the "Adoration." This had been used for many years as a step into the porch.

The ancient Bolsover Castle was built by William Peveril ("Peveril of the Peak") in the eleventh century, and underwent various vicissitudes of fortune. In 1613 it was purchased by Sir Charles Cavendish, the founder of the ducal house of Newcastle. At that time the old castle was in ruins, and in the year of his purchase Sir Charles began to build the present castellated mansion on the foundations of the ancient Norman keep, Huntingdon Smithson being his architect. Having completed this part of the building, Sir Charles began to erect the palace that crowned the terrace; and, dying in 1617, left the work to be finished by his son, earl and afterwards the first duke of Newcastle. Here Charles I. and his queen were entertained on three separate occasions. Ben Jonson's masque entitled "Love's Welcome" was composed for one of these occasions. Little more than the bare walls and the riding house now remain. In the Elizabethan reproduction of the Norman keep is a chamber constructed after the style of the celebrated "Star Chamber." Population of the parish, 2375.

BOLSOVER STONE, the yellow limestone of Bolsover in Derbyshire, was used in the construction of the new Houses of Parliament in London. It was selected for its fitness for ornamental work and colour, and was supposed to possess the elements of strength and durability; but it has been found to be sadly deficient in the latter qualities. It is a combination of carbonate of magnesia with carbonate of lime, in small granular crystals, without flint nodules or other blemishes.

BOLTON or BOLTON-LE-MOORS, a market-town and parliamentary borough in Lancashire, is 11 miles N.W. from Manchester, 43 miles S.S.E. from Lancaster, and 201 from London by the North-western Railway.

As early as the fifteenth century the town was the seat of considerable cotton and woollen manufactures, introduced by some Flemish clothiers, and the improvements made in the machinery for spinning early in the last century gave an impulse to its trade, which has been increasing ever since. Almost the first invention in point of importance originated in this town. This was the machine called a *mule*, which was the discovery of Samuel Crompton, who lived in a part of an old house about a mile from Bolton, called the *Wet in the Wood*, where the experiments were carried on which resulted in this valuable invention. No patent was taken out for the machine, which consequently came into immediate use, but with little benefit to the inventor except a parliamentary grant of £5000. In the meantime Sir Richard Arkwright, another native of Bolton, had established large factories in Derbyshire, where he brought cotton machinery to the greatest perfection. In consequence of the opposition of the labouring classes of Bolton, the introduction of the mule and of the power loom was not accomplished for some time; but after a while cotton factories, filled with machinery, began to rise up in various parts of the town. Fomeries and machine manufactories followed them. The spinning of fine cotton yarn is a staple trade of the town, but plain and fancy muslins, quiltings, counterpanes, dimities, cambrics, ginghams, &c., are also made.

The number of cotton-spinning mills in Bolton and immediate neighbourhood is about 150, and of weaving factories fifty, employing together about 30,000 persons. Fully two-thirds of the above manufactories and of the persons employed belong to the borough of Bolton. The bleaching works in the town and neighbourhood are among the largest in the kingdom. The iron-foundries and machine manufactories are numerous, and many of them are on a large scale. Other branches of the trade connected with the above are carried on to a considerable extent, and there are several large chemical and paper works in the town and its vicinity. The advantages of inland navigation have been enjoyed since 1791, when a canal was made from Manchester to Bolton, with a branch to Bury; from Manchester to Bury it runs by the side of the river Irwell. The distance by canal from Bolton to Manchester is 12 miles; from Bolton to Bury, 6 miles. The whole district through which the canal runs abounds with coal, which is the main source of the prosperity of the town. By means of the Lancashire and Yorkshire and London and North-western lines Bolton has admirable railway facilities with all parts of the kingdom. The town is situated in the parish of Bolton-le-Moors, and consists of the two townships of Great Bolton and Little Bolton, which are separated by the small river Croal.

The municipality consists of a mayor, sixteen aldermen, and forty-eight councillors. The population within the parliamentary limits in 1881 was 105,114, and the rapid progress of the borough is shown by the fact that these numbers mark an increase of 13,315 over 1871. The entire parish of Bolton contains 105,965 inhabitants.

The streets of Bolton are wide and straight, and the houses generally well built. Like many other places in Lancashire it suffered severely during the cotton famine, from 1862-65; but advantage was taken of the stagnation of trade to effect many much-needed improvements as regards sewage, paving, and cleansing the river, and also in laying out a public park, which is finely situated, and commands some extensive views. It is 46 acres in extent, and cost altogether £50,000. Nearly all the work in connection with it was done by the unemployed operatives, and was executed in a very satisfactory manner. There is another park about 11 acres in extent, which was presented to the town by Mr. Barnes, M.P., in 1864, and tastefully laid out at his expense. The town is well supplied with water brought from a distance of 4 miles. The springs are collected in large reservoirs near their source, from which the water is conveyed in pipes into other reservoirs, about a mile from Bolton, whence it is again conveyed through iron mains to the various parts of the town. The reservoirs are capable of containing altogether about 300,000,000 gallons.

Bolton contains several churches, the most noticeable being that completed in 1871, on the site of the ancient parish church of St. Peter's, which had fallen into a very dilapidated condition. It is very richly decorated, and cost altogether £50,000, the whole of which was defrayed by Mr. P. Ormerod. There are places of worship for all denominations of dissenters, some of them being new and handsome structures. The institutions for education are numerous. The free grammar-school was founded in 1641 by Robert Lever, citizen and clothier, of London. In 1862 a bronze statue to the memory of Crompton, the inventor of the "mule," was erected by the inhabitants at a cost of £2000. In 1870 Mr. Stephen Blair, once M.P. for the borough, bequeathed the sum of £20,000 for the erection of an hospital for the town, with £10,000 additional for the endowment of the institution. In 1874 an orphanage was erected by Dr. Chadwick, of whom there is a bronze statue in front of the Town-hall.

The chief public buildings are the new Town-hall, opened by the Prince of Wales in 1873, which occupies one side of the Market Square, and is an exceedingly handsome and convenient structure in the Italian style; Gas Offices,

Post Office, banks, Free Library, Mechanics' Institute, and Market-hall. The Market-hall is one of the finest in the county. It was erected in 1855 at a cost of £50,000. Most of the shops recently erected display considerable architectural taste, and the new mills are substantial and well arranged. Most of the working classes reside in neat and convenient modern cottages, which have been erected around the town in large numbers.

Bolton is a place of historical interest. At the commencement of the Civil War the inhabitants took the Parliamentary side, and held out till 1644, when, after a desperate struggle and several repulses, the Earl of Derby captured the town for the Royalists. He held it till after the battle of Worcester, when he was compelled to surrender, and was himself beheaded. The town was made a parliamentary borough by the Reform Act of 1832.

BOLTON ABBEY is a chapel in the West Riding of Yorkshire, 5 miles N.E. of Skipton, and 6 miles from the nearest station, Ilkley, which is 235 miles from London. The domain of Bolton is highly picturesque, and contains the fine ruins of the ancient priory. The gateway serves as shooting-box to the Duke of Devonshire, to whom the domain belongs. Bolton Abbey was built for Augustinian canons in the twelfth century. The abbey was frequently attacked and spoiled by the Scots, but was fairly prosperous. To the north of the church, between it and the river, is the churchyard, where Wordsworth placed his traditional story of the "White Doe of Rylstone."

BO'LU'S, a soft round mass of medicine larger and softer than a pill, and generally made up to be swallowed at once.

BOM'ARSUND, the capital of the Aland Isles, which were ceded to Russia by Sweden at the peace of Fredericshamm, 17th September, 1809. This group is situated at the entrance of the Gulf of Bothnia, between the coasts of Finland and Sweden, within a short distance of Stockholm. On Bomarsund, the largest of these islands, the Emperor Nicholas had commenced building fortifications, which, if completed, would have formed a standing menace to Sweden and Norway. They were taken and demolished by the English and French in 1854, and by a convention annexed to the treaty of Paris, between England, France, and Russia, the latter power engaged that henceforward "the Aland Isles shall not be fortified, and that no military or naval establishment shall be maintained or created there." Bomarsund was a fortress to which in a few years Sweaborg and Cronstadt would have been as nothing; in its harbour, and under its guns, the whole fleet of Russia would have been able to lie in security. Had it not been destroyed, in a few years the Gulf of Bothnia would have become a Russian lake, and Stockholm would at any moment have been at the mercy of Russia.

BOMB, a missile consisting of a hollow globe of iron, which, when charged with a certain quantity of gunpowder, is fired from a mortar or howitzer, generally at a considerable angle with the horizon, in order that by the momentum acquired in its descent it may exert a crushing force, and by its explosion have a destructive effect. From a French translation of a work by Valturinus, 1742, it appears that bombs were invented about the middle of the fifteenth century. In former times the maximum diameter in use in the British army was 13 inches, and these shells weighed about 195 lbs., having a bursting charge of 8 lbs. of powder. The introduction of rifled shell guns has, however, tended to supersede to a very great extent the use of mortars; but powerful howitzers of various sizes are still made for siege purposes, and their shells possess great powers of destruction.

BOMB VESSEL or **MORTAR VESSEL**, a ship or vessel which until late years usually formed part of a fleet intended by a bombardment to destroy or compel the surrender of some town or arsenal situated on the sea-coast. These vessels were small, of a light draught of water, and

fitted with sail-power sufficient to enable them to reach their destination. The armament consisted of one large mortar, throwing a shell 13 inches in diameter. The mortars were placed on traversing platforms in the middle of the deck, and they could be fired over either side of the ship at elevations not less than 45°. The platforms rested on strong beams, and these were supported by substantial pillars running down to the framing of the vessel. Their place in modern warfare is now taken by the small heavily-armed screw gun boat, which carries one long rifled gun in the bows, and is fitted also with one or two smaller pieces or machine guns to repel boarders, &c.

BOMBA'CEÆ, a group of plants belonging to the order MALVACEÆ. They are usually large trees, with broad deep-green leaves, and flowers of considerable size. This group contains some of the most majestic and beautiful trees that are known, but nothing of much medical or economical importance is furnished by them. Their wood is light and spongy; the long cottony substance found within their fruit, and which has gained for some of them the name of cotton-trees, is too short in the staple to be manufactured into linen; and the slightly acid or mucilaginous qualities that occur in the group are altogether inferior to those of many other Malvaceæ. The following are the most remarkable genera of the group:—*ADANSONIA*, *BOMBAX*, *CHEIROSTILIX*, *DURIO*, *ERIOCAERUS*, *OCHROMA*, *PACHIRA*.

BOM'BARD, an obsolete piece of artillery, which in former times was used to throw stone balls, after the manner of a mortar. It was very short and thick, and had a large bore. In the fifteenth century bombards were constructed that were capable of throwing balls weighing from 200 to 500 lbs. each.

BOMBARDIER' BEETLE is a name given to the genus *Brachinus* of the COLLEPTERA. These beetles possess a remarkable power of violently expelling from the anus a pungent acrid fluid, which, if the species be large, produces a discolouration of the skin similar to that caused by nitric acid. A loud report, considering the size of the insect, accompanies the expulsion of this fluid, which, being discharged, instantly evaporates. About five species of the genus *Brachinus* have been found in this country, of which *Brachinus crepitans* is the most common; it is found under stones, and occurs plentifully in chalky districts. An allied genus, *Aptinus*, differing from *Brachinus* chiefly in having no wings under the wing-cases, abounds particularly in warm climates.

BOMBARDMENT. This is the action of throwing shells and shot into an enemy's town in order to destroy the buildings, and chiefly the military magazines; for which purpose mortar, howitzer, and gun batteries are constructed in convenient situations, generally opposite to the most densely inhabited quarters. If the town is a seaport, bomb vessels also are moored along the shore, and the firing is kept up simultaneously on the land and sea sides, principally against the docks and arsenals of the place.

When an army invests a fortress, whether it proceed against it by the operations of a regular siege, or simply keep it in a state of blockade, a bombardment is one of the means resorted to in order to accelerate the surrender, by rendering its occupation dangerous to the citizens, and ruining the buildings in which the ammunition is secured, or in which the garrison while not on duty find repose. Among civilized nations generally it has become a principle to spare as much as possible the lives and property of individuals who are not actually engaged in the military service of the state against which an army is employed.

Amongst the most celebrated bombardments are those of Gibraltar, Copenhagen, Algiers, Sebastopol, Charleston, Strasburg, Paris, and Alexandria. The first of these places was invested on the land side by a Spanish army, which was afterwards united to that of France, and on the

sea side by the combined fleets of the two nations. The investment took place in 1779, but no remarkable actions occurred till 1782. In that year the besiegers converted some of their large ships into floating batteries, which, on 13th September, commenced a tremendous fire on the town, while the land batteries cannonaded the works in flank and rear: the garrison in return, paying little attention to these, pointed on the ships a corresponding fire of carcasses, shells, and red-hot balls. This work of destruction continued on both sides till about seven or eight p.m., when it nearly ceased. The utmost confusion and distress by this time prevailed in the fleet of the besiegers. Several of their largest ships caught fire, and two of them blew up with tremendous explosions.

The bombardment of Copenhagen took place in 1807, and was effected by a British army under Lord Cathcart, which closely invested the city on the land side, while the fleet under Admiral Gambier blockaded the harbour. The fire from the land batteries and bomb vessels opened on the evening of 2nd September, and continued till the night of 4th September, when a capitulation took place. In this bombardment the rockets invented by Sir William Congreve were used for the first time, and it is said that the cathedral, with above 300 houses, were destroyed by the shot and shell which were thrown into the town. In 1816 the united fleets of England and Holland, consisting of fifteen ships of war, besides gun-boats, under the command of Lord Exmouth, bombarded Algiers. The firing continued during twelve hours, in which time all the enemy's ships in the harbour were destroyed and great part of the town.

In the bombardment of Sebastopol, although a great deal of the fire was ultimately directed against the town, for some time the principal part was on the works surrounding it, and it can therefore perhaps hardly be called a bombardment in the strict sense of the word. The attack commenced on 17th October, 1854, and terminated on 8th September in the following year—not less than six distinct assaults having been made by the troops on the land side. The amount of ammunition expended by the English army alone was 251,872 rounds, or at the rate of about 6000 rounds per week, during the whole siege. The quantity of shot by the fleet was also enormous, the *Agamemnon* alone firing upwards of 3000 rounds in four hours.

The bombardment of Charleston, one of the most memorable events in the American civil war, was conducted under General Gillmore, and was rendered unusually notorious from the fact of his sometimes using a chemical compound similar in its effects to the terrible ancient Greek liquid fire.

The siege of Strasburg by the Germans, in 1870, was dignified by a bombardment of a very severe character, during which some public buildings—including the curious valuable old library—and a large number of private houses were destroyed. The commandant, General Ullrich, however, refused to capitulate, and a regular siege was then commenced. The inhabitants held out until an extensive breach had been effected and an assault threatened, when it was wisely decided to surrender.

In Paris, in 1870-71, although the forts were effectually bombarded, and some of them silenced towards the end of October by the Germans, the city itself then suffered comparatively little, but parts of it were much injured by the bombardment of the French themselves under MacMahon, when the city was held by the Communists.

The bombardment of Alexandria—or rather of the fortifications defending that city—by the British fleet in July, 1882, was remarkable as being the first time in modern history that a fleet of iron-hulled attacked a series of regular land forts. In this attack there were eight iron-hulled vessels engaged, assisted by five unarmoured gun boats. The forts were armed with a large number of old-fashioned smooth-bore guns, and in addition with many rifled Armstrong guns of 15 tons weight. The action commenced at seven in the

morning, and lasted until half-past five in the evening, by which time the forts were silenced and almost destroyed, while the ships had scarcely suffered any damage, and had only lost five killed and about twenty-six wounded.

BOMBAX, a genus of plants, the type of the group **BOMBACEÆ**. The species are large trees with a soft spongy wood, frequently used for making canoes. They are indigenous in South America and the East Indies.

Bombax cilia (common silk-cotton tree) is a native of the West Indies and South America. It frequently reaches a height of 100 feet. The down, which is contained in the seed-vessel, is very soft, but is too short to be used in the manufacture of cloth. It is made into hats and bonnets, and used for stuffing chairs and pillows by the poor in the districts in which it grows. The trunks of the largest are made into canoes, some of which will carry from fifteen to twenty hogsheads of sugar.

Bombax pubescens, from 20 to 30 feet in height, is a native of Brazil, in the province of Minas Geraes. The bark is used for making ropes.

The fruit of Bombax is a five-valved capsule, densely woolly on the inside. The staminal column is divided above into numerous stamens.

BOMBAY, the Western Presidency of British India, comprising twenty-four British districts and nineteen states, or aggregates of states called agencies, under the protection of her Majesty's Indian government. The territory thus composed extends from 28° 47' to 13° 53' N. lat., and from 66° 15' to 76° 30' E. lon. The British districts, including Sind, contain a total area of 121,465 square miles, and a population (according to the census of 1881) of 16,151,111 souls; the native states cover an additional area estimated at 71,769 square miles, with a population of 6,941,249 souls—grand total area, 196,234 square miles; grand total population, 23,395,663. The Portuguese possessions of Goa, Damão, and Diu, with an aggregate area of about 1116 square miles, and an estimated population of 128,955 souls, are also included within the geographical limits of this presidency. The capital of the province, the residence of the governor, and the headquarters of all the administrative departments, is Bombay City.

Boundaries.—Bombay Presidency is bounded on the N. by the State of Baluchistan or Khelat, the British Province of the Punjab, and the native States of Rajputana; on the E. by the Marhatta State of Nizam of Haidarabad; on the S. by the Presidency of Madras and the State of Mysore; on the W. by the Arabian Sea, and on the N.W. by Baluchistan.

Physical Aspects.—The Presidency of Bombay presents on the map the appearance of an irregular strip of land stretching along the eastern shore of the Arabian Sea, and extending up the lower portion of the Indus valley. The continuous coast-line is only broken towards the north by the Gulfs of Cambay and Cutch, between which lies the projecting peninsula of Kattyawar. The sea-board is generally rock-bound and difficult of access, though it contains many estuaries, forming fair-weather ports for vessels engaged in the coasting trade. Bombay and Karwar alone have harbours sufficiently land-locked to protect shipping during the prevalence of the south-west monsoon. Physically, as well as historically, Bombay may be roughly divided into two distinct portions, the Narbada (Nerbudda) forming the boundary line. To the north of that river lie Guzerat, Kattyawar, Cutch, and Sind; to the south the Marhatta country, including portions of the Deccan and the Karnatic, and the Konkan. The former of these tracts is for the most part a low plain of alluvial origin. In Southern Guzerat the valleys of the Tapti and Nerbudda form sheets of unbroken cultivation. But in Northern Guzerat the soil becomes sandy and the rainfall deficient; cultivation is largely dependent either upon artificial irrigation or the natural humidity caused by the neighbourhood of the ocean.

In Sind the surface is a wide expanse of desert sand, interrupted only by low cliffs or undulating sand-heaps. The geographical formation is distinct from that of the rest of the Indian peninsula, consisting of limestone rocks continuous with those found in Persia and Arabia. The latter of the two tracts is an upland country, furrowed with high mountains and deep valleys, which intercept the rain-clouds of the monsoons, and blossom with tropical verdure. The geological formation is composed of nearly horizontal strata of basalt and similar rocks, which naturally break into steep terraces and hog-backed ridges, and have produced, by their decomposition, the famous "black cotton soil," unsurpassed for its fertility. Perched upon these rugged eminences stand the impregnable hill-forts famous in Marhatta history. Within this second tract the Deccan, the Karnatic, and the Konkan are each marked by special features of their own. The Deccan, including Khandesh district, is an elevated plateau behind the Western Ghats. It is drained by several large rivers, along whose banks are fields of much fertility; but for the rest the air is dry and the rainfall uncertain. The Karnatic, or country south of the Kistna River, is a plain of lower elevation. The Konkan is the name for the narrow strip of land lying between the base of the Ghats and the sea. As a whole it is a rugged and difficult country, intersected by numerous creeks, and abounding in isolated peaks and detached ranges of hills. The cultivation consists only of a few rich plots of rice land and gardens of cocoa-nut. The rainfall is excessive.

Mountains.—The chief mountain ranges all have a general direction from north to south. In the north-west, on the right bank of the Indus, the Hala Mountains, a continuation of the great Suliman range, separate British India from the domains of the Khan of Khelat. In Sind there are low ranges of sand-hills, and in Cutch and Kattyawar several isolated peaks and cliffs, which form, geologically, a continuation of the Aravalli Mountains. Proceeding towards the south-east an extensive mountain chain is met with, which may be regarded either as a southern spur of the Aravalli Mountains or a northern prolongation of the Western Ghats beyond the valleys of the Tapti and Narbada. These hills separate Guzerat from the states of Central India, beginning in the neighbourhood of Mount Abu, and stretching southwards down to the right bank of the Narbada. South of the Tapti the country becomes rugged and broken, with isolated masses of rock and projecting spurs, forming the watershed for the great rivers of the Deccan. This rugged region constitutes, strictly speaking, the northern extremity of the Western Ghats, here called the Sahyadra Hills. That great range runs southward parallel to the sea-coast for upwards of 500 miles, with a general elevation of about 1800 feet above the sea, though individual peaks rise to more than double that height. The western declivity is abrupt, and the low strip of land bordering the sea-shore is seldom more than 40 miles in width.

Rivers.—Bombay Presidency has no great rivers which it can call its own. The outlying Province of Sind is penetrated throughout its entire length from north to south by the Indus, whose overflowing waters are the sole means of distributing fertility through that parched region. Its season of flood begins in March and continues until September, during which time the discharge of water, calculated at 40,857 cubic feet in December, is said to increase tenfold. The entire lower portion of the Delta is torn and furrowed by old channels of the river, for the surface is a light sand, easily swept away and redeposited year by year. The plains of Northern Guzerat are watered by a few small streams, the chief of which are the Subarnati and Mahi, both rising in the Mahi Kanta Hills, and flowing southward into the head of the Gulf of Cambay. The Nerbudda, in its westerly course to the sea from Central

India, has but a short section within the limits of the Presidency. The Tapti, though a smaller river, has a greater commercial importance. It flows through the whole length of Khandesh district, and enters the sea a little above the city of Surat. Both these rivers run for the most part between high banks, and are little used for purposes of irrigation. In the extreme south of the Presidency, in the district of North Kanara, westward-flowing streams become larger; one of them, the Sheravati, plunges downwards from the mountains in the celebrated Falls of Gersoppa—a succession of cascades, of which the principal is 890 feet in height.

Minerals.—The country is deficient in mineral wealth, though abundantly supplied with stone adapted for building and road-making. At Teagar, in the district of Dharwar, iron ore is mined and smelted, but the scarcity of fuel prevents operations on an extensive scale. In the same district large slate quarries are worked. There are five valuable limestone quarries near Kurrachee, and lime is burned in Belgaum district. The bordering mountains of Baluchistan are reported to contain large quantities of gypsum, copper, lead, antimony, and sulphur.

The Forests of Bombay belong to two separate classes,—the produce of the alluvial plains in Sind, and the produce of the mountains of the Western Ghats. The state reserves in Sind are estimated to cover an area of 352,041 acres, lying along the banks of the Indus. They are divided into blocks, locally known as *balas*, which are said to have been originally formed as hunting-grounds by the Amirs, the former Mohammedan rulers of the Province. Frequent changes in the course of the river sweep away large portions of these *balas*, the average annual loss from erosion being calculated at as much as 10,000 acres; and though fresh deposits of alluvion afford some compensation, it takes many years to replace the timber-trees thus carried off. The most valuable trees are teak, blackwood, babul (*Acacia Arabica*), which here attains a large size; bhan (*Populus Euphratica*), a soft wood which grows in great abundance in Upper Sind; and tamarisk, which never attains large dimensions, but is extensively used as fuel by the river steamers. The bamboo is altogether unknown in Sind, but the true date grows abundantly near Sukkar, in the upper part of the Province. The sowing of teak and babul plantations is conducted on an extensive scale.

Fauna. Among the wild animals peculiar to the Presidency may be mentioned the maneless lion of Guzerat, which zoologists are now disposed to regard as a local variety rather than a separate species, and the wild ass, frequenting the sandy deserts of Cutch and Upper Sind. Leopards are common, but the tiger has retreated before the advance of cultivation, and is now only found in remote jungles. The black bear is found wherever rocky hills and forests occur; and the bison, the most formidable of all Indian larger game, haunts the mountain glades of Kanara. Of deer, the sambar is found in the same localities as the bison, though in greater abundance; while the nilgai and the antelope are so numerous, especially in Guzerat, as to become a regular pest to the cultivators. Small game, such as snipe, quail, partridges, and wild-duck, can generally be obtained by the sportsman in all parts of the Presidency, even within easy reach of the suburbs of Bombay. Concerning domestic animals, it may be said that the cattle of Bombay are everywhere too numerous for the pasturage available. In breeding no attention is paid to artificial selection, and the present poor condition of the animals is said to be becoming worse. In Guzerat a class of bullocks of more than ordinary size is met with, used especially for drawing carts along the deep sandy roads of that country. Into the south of the Presidency is a yet more valuable breed of draught oxen imported from Mysore. In certain parts buffaloes are commonly used for ploughing; and throughout Sind the camel is the one animal for all

agricultural purposes. In former days the horses of Kattyawar and the Deccan were highly valued for military objects, but both breeds have now much deteriorated.

AREA AND POPULATION OF THE BRITISH DISTRICTS IN BOMBAY PRESIDENCY.

	Area. Square Miles.	Population.
Deccan—		
Khandesh,	10,162	1,028,642
Nasik,	8,140	734,386
Ahmednagar,	6,647	773,938
Poona,	5,099	907,235
Satara,	5,378	1,116,050
Sholapur,	3,925	662,986
Belgaum,	4,592	938,750
Dharwar,	4,565	988,037
Kaladgi,	5,696	816,037
Total,	54,204	7,966,061
Konkan—		
Kanara,	4,235	398,406
Ratnagiri,	3,789	1,019,136
Kolaba,	1,482	350,405
Bombay city,	22	644,405
Tanna,	4,052	847,424
Total,	13,580	3,259,776
Guzerat—		
Surat,	1,588	607,087
Broach,	1,358	350,322
Kaira,	1,561	782,733
Porch Malah,	1,731	210,713
Ahmedabad,	3,844	829,637
Total,	19,082	2,810,522
Sind—		
Karachi (Kurrachee),	11,091	423,195
Haidrabad,	9,053	721,947
Thar and Parkar,	12,729	180,761
Sikarpur,	8,813	776,227
Upper Sind Frontier,	1,913	89,985
Customs and Railways,	—	120,432
Total,	46,599	2,312,847

NATIVE STATES IN THE BOMBAY PRESIDENCY.

	Area.	Population.
Baroda,	4,399	2,000,225
Kolhapur,	3,184	802,691
Cutch,	6,500	487,305
Mar Kanti Agency,	4,900	447,056
Kharapur (in Sind),	6,109	127,000
Kattywar Agency,	20,338	2,312,629
Palampur,	8,000	502,586
Rawal Kanti,	4,793	505,732
Canbay,	350	83,494
Sawant War,	900	190,814
Jangira,	325	71,996
Southern Marhatta States,	2,734	610,434
Santara Jagas,	3,598	117,295
Jawar,	535	37,406
Surat Agency,	1,082	124,808
Sawanur,	70	17,288
Narukot,	113	6,837
Punt,	960	47,033
Kandesh Petty States,	3,840	39,411

Agriculture.—The wide extent and the varied configuration of the Bombay Presidency permit great variations of agriculture. The two most important food crops are *bajra* or great millet, and *joari* or spiked millet, which are especially cultivated in the Deccan. Rice is chiefly grown in the lowlands of the Konkan. Wheat is extensively cultivated in parts of Guzerat and in Sind, and barley is grown in the same localities to a smaller extent. The aboriginal tribes mainly support themselves on inferior cereals, such as *nachani* and *kodra*, which they plant in patches of cultivation amid the primeval jungle that clothes the hill-sides. The most important kinds of pulse are gram or chickpea, *tur*, *kulthi*, and *mug*. The oil-seeds are mustard, linseed, castor-oil, til, which yields the gingelly oil of commerce, and *kasamba*, or safflower. Among fibres, cotton holds by far the chief place, both in the Deccan and in Guzerat; *ambari* or Deccan hemp, and *suu* or Konkani hemp, are also grown. The miscellaneous crops include tobacco, of which the finest quality is produced in Kaira district; sugar-cane, which requires a rich soil and a perennial water supply; potatoes, grown in the hill-country near Poona; red pepper, turmeric, other spices, and indigo.

Manufactures.—Apart from the new industry of cotton spinning and weaving by means of steam machinery, the manufacture of cotton cloth in hand-looms is still conducted in many villages throughout the Presidency. A curious distinction in this respect separates the Gujarathi and Marathi speaking races. The former prefer their cotton goods printed, while the latter only wear stuffs that have been dyed in the thread. The decoration generally consists of a simple border, but the more expensive articles are frequently finished off with silk, or with gold and silver lace. The natives are gradually learning to qualify themselves for the posts requiring superior skill, which have hitherto been mostly occupied by operatives brought from England. Besides supplying the local demand, these cotton-mills are beginning to find a market in foreign countries, especially for their twist and yarn, which meets with much favour. Sind weavers are reckoned the most skilful. The best *saris*, or women's robes, are printed at Ahmedabad and Surat. Carpets, rugs, horse-cloths, towels, napkins, &c., are manufactured in the jails throughout the Presidency, especially in Sind. Ahmednagar is celebrated for its carpets, and Khandesh and Dharwar for drugget rugs and bullock-cloths. The raw material employed in manufactures of silk is imported from China. The chief seats of silk weaving are Ahmedabad, Surat, Poona, Nasik, and Yekla. The two first of these places produce broades of silk and gold and silver thread, which are famous throughout India; the three last have a reputation for silk or cotton *saris*, finished off with rich borders of gold, silver, or silk lace, and beautifully filled in with designs executed on the looms. The preparation of gold and silver thread is performed with great skill. It is said that one rupee's worth of silver can be drawn out into 800 yards in length. The manufacture of coarse paper from raw vegetable fibres is conducted in several of the large towns, especially at Ahmedabad and Baroda. Woollen manufactures are almost confined to the saddle-cloths, blankets, and felts of Sind. Iron-work, besides cutlery, is still hammered with great skill at Ahmedabad, where the beautiful gates of the tomb of Shah Alan afforded an example of an extinct industry in perforated brass-work. Fine art is represented by a large number of ornamented articles manufactured in all parts of the Presidency. The personal decorations of the women of Guzerat are distinguished by solidity, and those of Marhatta women by intricacy of design. The Mohammedans and Parsees also have each styles of ornament peculiar to themselves. The goldsmiths' work of Sind is very beautiful. The embossed gold and silver work of the Cutch workmen is much sought after, and they have established

a colony at Ahmedabad. This city and Surat are also celebrated for wood-carving. Most of the houses are ornamented in this way, and furniture and boxes are carved in ebony and blackwood. The best sandal-wood carving comes from Coompta (Kumpta), Kanara. Sculpture has been practised by the stone-cutters of Cutch and Kattyawar from time immemorial. The more elaborate portions of the stone-work on the public buildings in Bombay were executed by these workmen, trained in the School of Art and the Public Works Department.

Roads and Railways.—The roads throughout the Presidency are chiefly constructed and maintained out of local funds, by the agency of the district officers. The two chief railways under the control of the Bombay government are the Great Indian Peninsular, with 1278 miles open, and the Bombay, Baroda, and Central Indian, with 417 miles. Both these are guaranteed railways of the standard gauge of 5 feet 6 inches; and in addition there are several minor branches. Both have their terminus in Bombay Island. The Bombay, Baroda, and Central Indian Railway runs due north along the sea-coast, past the cities of Surat, Broach, and Baroda. There are no navigable

canals in the Presidency, but the main channel of the Indus is kept open by the state at an annual cost of about £6000.

Land System.—Much of the great prosperity of Bombay Presidency is due to a very liberal land settlement, introduced in 1836. It is a field settlement, but it differs from the Madras system, from the circumstance that in Bombay, instead of an annual settlement, the rent is fixed for each field for a period of thirty years. Each ryot may every year cultivate what fields he pleases, and give up what he pleases—the fields which are not taken up for cultivation being let annually by auction as grazing grounds. A new era of prosperity and progress was inaugurated in the Bombay Presidency by this settlement, the faults of which are on the right side, namely, assessments, which are said to be too low. Under it a great number of the peasants are amassing wealth, the occupation of the farmer is nearly gone, and the agricultural class in point of comfort are in every respect equal to those of England, all being, according to their ideas, comfortably clothed, housed, and fed to the full, and the majority able to indulge in what are to them luxuries. In this Presidency, once so waste, there



Bombay.

is now very little culturable soil unemployed. The land revenue amounts to about £3,700,000 per annum.

The trade with the United Kingdom in recent years is shown in the following table:—

	Imports from Bombay.		Exports to Bombay.
1882,	£13,337,602	...	£10,266,007
1883,	10,135,906	...	12,204,107
1884,	10,612,172	...	12,181,690

More than half of the imports consist of cotton. The other articles of importance are seeds (flax, linseed, and rape) and wool. The chief exports from this country are cotton, hardware, and machinery.

The value of the merchandise now annually imported into Bombay from all countries is about £16,000,000, in addition to which from £6,000,000 to £16,000,000 in specie is received. The exports of merchandise are about £25,000,000, and of specie about £1,500,000. The revenue of the Presidency is £10,000,000 per annum, and the expenditure somewhat less. The former is derived chiefly from three great sources, viz. the land-tax, opium, and customs. By far the largest item of expenditure is

still that for military charges, though they have been considerably reduced of late years. The number of troops employed is 40,000, of whom 27,000 are natives.

The government is vested in a governor and three members of the council, of whom one is the commander-in-chief, the whole administration being subordinate to the governor-general of India in council. In the south there are many native Roman Catholic and Nestorian Christians. The Parsees are now almost entirely confined to this part of Asia. The intellectual as well as moral condition of the people has been much improved of late years; there is an improving educational system in active operation; and recently native youths, after being educated in England, have qualified themselves to practise as barristers in India.

There are in the Presidency an English Episcopal bishop, with several clergy, a Scottish church, and Roman Catholic establishments.

The first European nation to have dealings with the west coast of India was the Portuguese. In 1498 Vasco da Gama landed at Calicut, five years later the great Albuquerque conquered Goa, and as early as 1532 the Portuguese are found in occupation of the Island of Bombay. For 100 years they maintained their monopoly of the

Eastern trade. The first English ship is said to have arrived at Surat, then the emporium of Indian commerce, in 1608. Shortly afterwards the English merchants fought a sea-battle with the Portuguese near Surat, and as the result of their victory obtained a charter from the Delhi emperor Jahangir in 1613, entitling them to establish a factory in that city. The Dutch received a similar authorization in 1618. Bombay Island, comprising the present Bombay city, was ceded to the English crown in 1661 as part of the dower of the Infanta Catharina on her marriage with Charles II. A British fleet was sent out under the Earl of Marlborough to take possession of the island; but a dispute arose with the Portuguese governor, and in 1668 the king was glad to hand over his unprofitable acquisition, at that time considered as the grave of Europeans, to the newly-formed East India Company, on payment of the annual rent of £10 in gold. The total revenue was estimated at 75,000 scaphins, or about £6500, paid by a population of 10,000 souls. The company forthwith adopted measures to strengthen the fortifications, attract European settlers, and encourage manufacture and commerce. In 1686 the chief control of all the company's possessions in India was transferred from Surat to Bombay, which was erected into an independent Presidency in 1708, on the amalgamation of the two rival English companies trading with India; and finally, in 1773, Bombay was placed in a position of qualified dependence upon the governor of Bengal at Calcutta, whose place is now filled by the viceroy. For more than a century the position of the English at Bombay was merely that of traders, who had successfully infringed the monopoly of the Portuguese and the Dutch, but were hemmed in on the landward side by the rising power of the Marhattas. The first of the Marhatta chiefs with whom they came in collision was Angria, who, from his stronghold on the island of Kolaba, dominated the entire coast of the Konkan with a numerous private fleet. In 1756 the governor of Bombay, in alliance with the peshwa, despatched an expedition by sea, which captured Angria's fortified harbour of Swamdruggad in the same year an expedition sent from England, under the joint command of Admiral Wadsworth and the celebrated Clive, stormed Gherry on Vizagapatnam, and won a booty of £100,000. The power of the Marhatta princes was thus broken, but the only territorial acquisition made by the English was a few villages on the mainland south of Bombay. In 1774 the Bombay government commenced the first Marhatta war, on the occasion of a disputed succession to the title of the peshwa. This war was marked by the inglorious convention of Wagah, and the repulse of General Goddard at the foot of the Bor-Ghat. It was terminated by the treaty of Salsette, in accordance with which the English retained permanent possession of Salsette, Elephanta, Karanga, and Hog Island, but gave back Bassin and all their conquests in Guzerat to the peshwa, and made a breach to Sindhia. The castle of Surat had been a British land since 1759, and in 1800 the entire island of that city was transferred to them by the Marhatta prince, whose descendants retained the empty title until 1842. The second Marhatta war was occasioned by the treaty of Bassin in 1802, by which the peshwa accepted the subsidiary system that formed the keynote to the Marquis of Wellesley's policy. As the result of that war a considerable tract in Guzerat, including the present districts of Surat, Broach, and Kaira, was ceded to the British, and their political influence became predominant at the courts of Poona and Bareda. During the interval of peace that followed no measures were taken for destroying the haunts of the pirates who then infested the Gulfs of Cambay and Cutch (Kathich). In 1807 the states of Kattyawar were taken under British protection, and in 1809 the Rao of Cutch was induced to sign a treaty promising to co-operate in the suppression of piracy. But

no sooner had the peshwa, Baji Rao, been restored to his throne at Poona by a British army, than he began to plot for the expulsion of the British from the Deccan. At last, in 1817, he suddenly attacked the resident, Mr. Elphinstone, who retired to Kirka, where a small British force was stationed, which a few days afterwards utterly defeated the whole army of the peshwa. After a few more engagements the fugitive peshwa surrendered to Sir John Malcolm. A pension of £80,000 was guaranteed to him for life, but he was deprived of all his dominions. By this step the Bombay Presidency was increased by Nasik, Sholapur, Belgaum, Kaladgi, Dharwar, Ahmedabad, and the Konkan, thus receiving at one time the greater part of its present territory. At the same date Holkar made over his rights in Khandesh to the British. Satara lapsed to the paramount power in 1848, on the death of the last lineal descendant of Sivaji without heirs; the non-regulation tracts of the Panch Mahals were ceded by Sindhia in 1860; and in 1861 the southern limits of the Presidency were extended by the transfer of the district of North Kanara from Madras.

The history of Sind forms a chapter apart from that of the rest of the Presidency. Shortly after the beginning of the present century the government of that country was assumed by four brothers of Baluchi origin, known as the Talpur amcers. The advance of the British power, and especially the right of passage up the Indus, at the time of the Afghan War, caused complications with the amcers of Sind. Hostilities were precipitated by an attack upon the British residency at Haidarabad, and the war that followed was signalized by the decisive victory of Miani (Meenace). The Province was annexed to the British empire in 1843, and the conquering general, Sir Charles Napier, was appointed the first commissioner. Sind continues to be administered as a non-regulation province, and at the present time a proposal is under consideration to detach it from Bombay, and place it, together with the frontier districts of the Punjab, immediately under the supreme government of India.

The recent history of Bombay is destitute of any stirring incidents. Peace has remained unbroken, even during the troublous period of 1857, when the border line between mutiny and discipline was marked by the limits where the Bengal and Bombay armies touched. The local army has done good service in many climes. In Afghanistan and Persia, in Burmah and China, in Aden and Abyssinia, and more recently in Egypt, the Sepoys of Bombay have shown themselves willing to do their duty wheresoever called. But the chief glory of British administration has lain in the development of the arts of peace. Instead of the chronic disorder of the Marhatta period, absolute security is now guaranteed to life and property. Where bands of irregular horsemen formerly collected a scanty tribute from the villagers at the spear's point, the land revenue is now realized by peaceful operation of law in amounts larger than could be conceived in the wildest dreams of extortion.

The railway, a triumph of engineering skill, climbs with ease the famous Bor-Ghat, which in old times shut off the fertile plateau of the Deccan from the sea coast, and once witnessed the discomfiture of a British army. A series of administrative reforms, originated by Mount Stuart Elphinstone, governor of Bombay from 1819 to 1827, have been continued and developed by the subsequent succession of rulers, and the benefits of civilization have been widely distributed through the land. The cultivator is no longer a tenant-at-will of the state, liable to unlimited exactions of revenue; his position is now that of a part-owner of the soil, with rights which he can transmit by seal or descent, subject only to the payment of a rent-charge fixed for a term of years.

BOMBAY, CITY OF, stands principally on a narrow neck of land at the S.E. extremity of the Island of Bombay, on the west coast of the Indian peninsula, in

18° 56' N. lat., 72° 53' E. lon. The Island of Bombay belongs to a group including Salsette—joined to it by a new causeway and arched stone bridge, constructed by the government, aided by a large contribution from Sir Jamsetjee Jejeebhoy—Caranja, Elephanta, Colabba, Butcher, Woody, and Cross Islands, which, being disposed of in a crescent manner, inclose its harbour. The houses are of wood, with verandahs and sloping tile roofs. The shops and warehouses, both European and native, are upon a large scale. The government house, within the fort, is a large, convenient building, used principally for conducting the public business. The governor has two other residences—one at Malabar Point, the S.W. extremity of the island, the other at Parell, about 4 miles from the fort, near the eastern shore of the island.

In 1716 the population of the Island of Bombay was 16,000; in 1816, 161,550; in 1819, 556,119; and in 1881 it had increased to 773,196, or about 7000 more than that of Calcutta. It is composed of European, Indo-Europeans, Jews, native Christians, Parsees, Mussulmans, Hindus, Brahmans, Chinese, and negroes.

The property of the island belongs chiefly to the Parsee inhabitants, who are the principal merchants; and it is usual for most European houses of commerce to contain one or more Parsee partners, who supply a great part of the capital.

A wonderful change has been wrought in Bombay during the last twenty years. Until 1865 the noxious flats in the centre of the island sent forth their exhalations; the city was undrained, the markets were dens of pollution, the crowded fort and native town were the abode of epidemics; the wealthiest citizens lived in tiled bungalows which a captain in any military station would have despised; the roads and streets were impassable from filth and roughness. Bombay, enjoying the finest site between Sydney and Constantinople, was the meanest capital in the world, and destitute of almost every civilized appliance except water; and destitute it might have remained had not the government determined to secure for public purposes some portion of the wealth which was pouring into the city, in consequence of the high price to which cotton had reached, owing to the failure of the American supplies. The horrible condition of the city and the influx of inhabitants during the mania raised the mortality to thirty-five in a thousand, and this alarming state of affairs led to the passing of a new municipal Act. This proceeding at the government resulted in the sale of the valuable site of the fort walls, which were destroyed, and in the encouragement of some of the *nonnunc riches* to devote some of their rapidly acquired wealth to public objects. The ruin which soon overtook Bombay, in consequence of the close of the American civil war, and the rapid fall in the value of cotton, so interfered with the latter policy that the government of India had to come to the rescue with special grants of money, and even a loan for public works in the island. That ruin did not affect the Municipal Act, and under its provisions it may be said that an almost new Bombay was created, and the annual rate of mortality decreased from thirty-five to twenty-two per thousand. More than £330,000 sterling is raised every year, and expended on an area covering upwards of 18 square miles. Wide roads have been driven through the filthiest and most criminal quarters of the native town. The old streets have been widened whenever an opportunity offered, and some have become most picturesque, their carved and coloured wooden verandahs towering up in tiers which approach each other, till the visitor is reminded alternately of Nurnberg and old Edinburgh. Fountains, ornamental lamps and railings, a Rotten Row like that of the Esplanade along Back Bay, and humbler, but not less necessary, public conveniences, have converted Bombay into a city worthy of the western capital of India. One of the greatest improvements consists in the Arthur Crawford markets and slaughter-houses.

The latter are placed 8 miles off at Bandora, with cattle sheds and grazing ground. The cattle and sheep are killed under English superintendence, a daily train runs the meat in waggons constructed for the purpose into sidings adjoining the new markets, and there, still under English superintendence, it is sold to a varied crowd of nationalities. The water supply of the city was much improved and increased in 1872.

While these and other municipal improvements, such as the Victoria Gardens and Museum, were going on, new Bombay has slowly risen between the old Fort and Back Bay, while the Elphinstone works, begun long before the mania, with smaller undertakings, have gone on to reclaim the whole foreshore of the harbour. In 1861 there was only one public building worthy of the place—the Town-hall. In 1883 a great change had taken place. The Elphinstone Circle, with its fine *Place*, flanked at one end by the Town-hall, and on the other by new Bombay, with the breeze steadily setting in from the Indian Ocean, accommodates the merchants in a princely style. Town and Back Bay two great lines of streets stretch away south to the Apollo landing-place and north to the native quarter. In the first, on the site of the old fort walls, are situated the very fine building for the National Bank of India, the municipal offices, and the Sassoon Mechanics' Institute—gem of a building, dwarfed, unfortunately, by the more massive piles around it. In the second line the new post office, an exceedingly handsome edifice, stands on the outside, and the offices of the public works department on the other. There are the high court, the university, and the financial office. But the breast pile of all is the imposing line of the general *secretariat*. All these are clustered together, and present a very striking appearance. Bombay, in fact, does its best to prove worthy of its magnificent site, and to prepare for the passenger trade of all India.

We have spoken of municipal and official Bombay; but the loss said of the houses of the citizens the better. Hideous tiled roofs disfigure even the new buildings, and the private houses still consist of wood and daub, and are meant to court a fire or to last only one generation.

Bombay is the seat of a supreme court of justice, the whose decision there is no appeal except to the queen's council. It contains banks, insurance offices, a chamber of commerce, the three several literary and scientific institutions, and benevolent and religious associations. Its chief educational establishment is the Bombay University, founded by Lord Elphinstone in 1857, in which English and the science and literature of Europe are taught with great success. It has been largely enriched and endowed by wealthy Settias of Bombay; and there are affiliated to it six colleges, seventeen high schools, and 133 middle schools, besides two aided schools, nineteen aided high schools, and ninety-four aided middle schools. There are also numerous schools for the native Hindus. The city was visited by Prince Alfred in 1870, and by the Prince of Wales in 1875, on the occasion of his Royal Highness' Indian tour. A handsome equestrian statue of the latter was erected in 1879.

Several lines of railway converge at Bombay from different parts of India; since 1870 it has possessed uninterrupted communication with Calcutta, about 1400 miles distant, and it has also excellent telegraphic communication.

This town is by far the principal port in the Presidency, and the tables given in the previous article will therefore furnish a reliable estimate of the extent and character of its commerce. The harbour is one of the largest and safest in India—hence the name given to it by the Portuguese of *Bom Bahia*, i.e. "good harbour." It is 8 miles in diameter, and affords good anchorage and shelter for fleets of ships of the largest burden. It is also the only great inlet in India where the rise of the tide is sufficient to permit the construction of wet docks on a large scale, the spring tides ordinarily rising 14 and occasionally 17 feet.

The trade of the port has considerably increased since the opening of the Suez Canal, and a large and growing commerce has sprung up between Bombay, Trieste, Genoa, Constantinople, and Odessa.

BOM'BAY DUCK is the common name given to *Harpodon nehereus*, a fish belonging to the family Scopelidae, in the order Physostomi. This fish is caught in great numbers on the Bombay and Malabar coasts, at the mouths of the Ganges and Irawaddi, and at Canton. When salted and dried it is a favourite dish with Anglo-Indians, and is exported in large quantities. The native name is "Bummaloh." This fish has an elongated body, covered with thin transparent scales. The head is very thick, with a very short snout. The cleft of the mouth is very wide. The mouth is furnished with a great number of rasp-like teeth, the largest of which are in the lower jaw and are barbed at the points. The ventral fins are long, and have nine rays. In addition to the dorsal fin, which is placed in the middle of the body, there is a small fin on the back near the tail, to which the name *adipose* or fatty fin is usually given. The tail fin is of moderate length. When just captured the body of this fish is brilliantly phosphorescent. It is remarkable for its voracity.

BOMB'BAZINE (from the Greek *bombur*, which signifies both the silk-worm and the silk produced by it) is a woven fabric in which the warp is formed of silk, and the weft or sheet of worsted. The worsted is thrown on the right side, which has a twill upon it. The manufacture originated in Norwich, among the Dutch settled there, about 1575. It is now very little used.

BOMB'IC ACID, a liquid produced from the silk-worm, analogous in some of its features to the formic acid produced from ants; it has not been very accurately investigated.

BOMB-PROOF. This name is given to a military magazine, or other building, when its roof has sufficient thickness to resist the shock of shells falling on it, after being projected from mortars at considerable elevation, and it is generally understood to signify an isolated building, rectangular on the plan, formed of brick or stone, and covered with a vaulted roof of the same material. The interior has in a vertical and transverse section of the vault, sometimes a semicircle, but now more generally a parabola; and the exterior surface of the roof has the form of two inclined planes meeting in a ridge parallel to the sides of the building and over the middle of its breadth.

BOMBS or VOLCANIC BOMBS, in geology, are spherical masses of cold lava, found near some active or recently extinct volcanoes. They are sometimes hollow, or others vesicular or fine grained, and are formed by the ejection of molten lava into the air, which assumes a spherical form by the pressure of the contained steam. The so-called bombs of some basaltic districts are, however, produced by the concentric disintegration of lumps of basalt.

BOMBYCIL'LA. See WAX-WING.

BOMBYLI'IDÆ is a family of insects of the order Diptera, distinguished chiefly by having a long proboscis. The body is short and very hairy. The antennae are of moderate length, and have three joints. The proboscis is very long and slender, projected in front of the head, and covered with delicate bristles. In one species, inhabiting the Cape of Good Hope, the proboscis is more than four times the length of the body. The head is small, the thorax wide, and the abdomen flattened and composed of six or seven segments. The wings are long, and even when in repose are kept at full stretch. The legs are long and very slender.

The species of this tribe are all remarkable for their great swiftness of flight; two species of the genus *Bombylius*, *Bombylius major* and *minor*, are not uncommon in open parts of woods, frequenting sunny banks, where they may be seen, in the month of April, hovering over flowers, from

which they sip the sweets by means of their long proboscis, which enables them to do this without settling on the flowers. At one time they will be seen apparently quite motionless in the air—for their wings vibrate so rapidly that they cannot be discerned—a moment after they will make their appearance at a few yards' distance, having darted from one spot to the other with such rapidity that the eye cannot follow them. In their flight they emit a humming sound. They are sometimes called bee-flies.

There are three other genera—*Nemestrina*, *Lomatia*, and *Anthrax*—containing numerous species. *Anthrax morio*, a species of the genus *Anthrax*, is figured in the Plate DIPTERA. The family Bombyliidae has a wide geographical range.

BOM'MELERWAARD ("Bommel-meadow"), an island of Holland, formed by the Waal and the Meuse. It is in the province of Gelderland. There are seventeen villages on the island, and the town of Zalt-Bommel. Flax and hops are largely cultivated. Population, 15,000.

BONA (called by the Arabs *Beled-el-Aneb*) is a seaport town in the province of Constantina, in French Algeria. It is situated in 37° N. lat. and 7° 46' E. lon., about 265 miles E. of Algiers, and had a population of 20,000 in 1883. It lies on the west side of a bay in which there is good anchorage. The Seibous, a considerable river, enters the sea about 2 miles to the S.E. The town has been occupied since 1832 by the French, who have greatly improved its sanitary condition and changed its entire aspect. There are markets, bazars, cafés, reading-rooms, and a theatre. Several fine quays have also been built. The exports are cattle, leather, oil, wax, wool, and iron ore. The land in the neighbourhood of Bona is very fertile, and numerous French colonists are now settled upon it. Bona is the principal rendezvous of the vessels employed in the coral fishery, which extends along the coast as far as the island of Tabarka, which belongs to Tunis. There is regular steam communication with Marseilles and Cette in France, and Algiers and Tunis in Africa. In the neighbourhood of Bona are the ruins of the ancient *Hippona* or *Hippo Regius*, of which St. Augustine was bishop. It was destroyed by the Mohammedans in 646.

BONA DE'A ("the kind goddess"), a Roman divinity whose name was always kept secret; but it is probable that the "Bona Dea," was Fauna, or Fatua, wife, sister, or else daughter of the ancient Latin god Faunus or Fatuus. (She is also identified with other goddesses.) At the secret rites held by the Roman ladies on the 1st of May, at the house of the consul or prætor of the year, music, games, and ceremonies were performed in her honour; and no male persons were allowed to be present. The goddess represented some general female principle, and these mystic festivals were deemed essential to the welfare of the state. Oracles were delivered by the Bona Dea to her worshippers, through the medium of the Vestal virgins who conducted the ceremonies. The horror with which it was discovered that the licentious Clodius, whose name survives as Cicero's enemy, had profaned the rites of the Bona Dea shows the high importance attached to them. He had entered Caesar's house, where they were being held on the 1st of May, B.C. 62, in the disguise of a female musician. Caesar suspected, with but too good reason, that an intrigue with his wife had tempted the worthless youth to such a crime; and at once put away Pompeia, with the memorable words, "Caesar's wife must be above suspicion." Clodius was tried for his crime, pursued by Cicero with severity, but acquitted by favour of lavish bribery.

BONA FIDES (and **BONA FIDE**) is an expression often used in common life. It is also often in the mouths of lawyers, and it occurs in Acts of Parliament, where (in some cases at least) it means that the Acts referred to must not be done to evade the law, or in fraud of the law, as we sometimes express it, following the Roman

phraseology (*in fraudem legis*). It appears to be used pursuant to the meaning of the words, in the sense of good faith, which implies the absence of all fraud or deceit. *Bona fides* is therefore opposed to fraud, as in the case of a person who holds an estate upon a title which he honestly believes to be good, although he may not be the rightful owner. Should he become aware of the latter fact, *bona fides* no longer exists; but if the question raised be a difficult one, requiring litigation for its solution, it may continue until the decision of the law is pronounced in the form of a final decree.

The term has come a great deal into use of late years from the restrictions placed upon the sale of alcoholic liquors on Sunday, and during certain hours of the night, being relaxed in the case of *bona fide* travellers needing refreshment.

Bona fides plays a considerable part in the jurisprudence of Scotland. An illegal marriage, if *bona fides* be shown, is sufficient to legitimize the children thereof; and under similar circumstances the profits from an illegal tenancy may be retained by the tenant if he can be shown to have occupied purely *bona fide*. Such maxims are unknown in English law. They are derived from the more enlightened ancient Roman jurisprudence.

BONAPARTE, originally **BUNAPARTE**, the patronymic of the most remarkable family or house of modern times—remarkable not for the good it has accomplished, but for the terrible evil it has wrought; the scourge of Italy and of Spain from within, of all Europe from without; on two separate occasions, the direct and sole cause of the ruin of France; and still, through the fatal blaze attending military glory, sufficiently powerful to stir up, in the insignificant persons of its degenerate descendants, civil discord of the most alarming kind.

CARLO MARIA BUONAPARTE and LETIZIA RAMOLINO were the parents of the family which Napoleon made so conspicuous. It is averred, indeed, that a long and superb pedigree would reveal itself to minute research, and that Carlo Buonaparte could have linked himself with noble Italian families of the party of the Ghibellines; but the proud words of Napoleon, when Francis of Austria inquired concerning his emblemmatics, were—"Tell the Emperor of Austria that I am the *Rudolf of Hapsburg* of my family." But it is not necessary to peer through antiquity to secure for Napoleon and his brothers a most honourable origin. Carlo Buonaparte (he was the last who employed the orthography *Buonaparte*) was a Corsican lawyer of Genoese descent, of moderate but adequate means, and in the gallant contest under Paoli he showed that he understood and could answer the call of patriotism. He died at Montpellier in 1785, of cancer in the stomach. He was accompanied in his campaigns with Paoli by his wife, Letizia Ramolino, who was reputed the most beautiful young woman in Corsica of her time. Reflecting on the chiselled and stately symmetry of the countenance of Napoleon, and of the soft and exquisite loveliness of the Princess Borghese, his sister, as immortalized by Canova's chisel in the well-known statue at Rome, one is little inclined to question the rightfulness of Letizia's fame; but, passing from beauty of mere feature, we are assured by the facts of history that she was a woman excelled in nobility of mind by few; and she possessed an integrity which nothing could shake, a firmness which never wavered, and that temperance amid unlooked-for prosperity which cannot exist apart from greatness of soul. As with Goethe and other distinguished men, Napoleon liked to trace whatever quality he considered good in himself or permanently great to his having some resemblance to his mother; nor are the honour given to *Madame Mère*, and the fine traditions connected with her, yet forgotten. The widow Buonaparte had moved to Marseilles in 1793, and there lived in penury. After Napoleon became first consul, *Madame Mère* came to Paris, receiving formally that

well-known title on the foundation of the empire. At her son's downfall in 1815 she retired to Rome, where she died in 1836.

Carlo and Letizia Buonaparte had the following family:—Joseph, Napoleon, Lucien, Maria Anna (afterwards renamed Elisa), Louis, Carlotta (afterwards renamed Marie Pauline), Maria Amoneiata (afterwards renamed Caroline), and Jerome.

MARIA ANNA, or ELISA, who married Bacciocchi and became grand-duchess of Tuscany, lived unobtrusively, without accomplishing anything that requires to be recorded. Of PAULINE, PRINCESS BORGHESI, we have indeed stirring reminiscences. That could have been no ordinary beauty which moved a Canova from his composure; but it is best perhaps that, surrounded by the halo of so fine a myth, the exquisite princess should be permitted to sleep in peace. She was Napoleon's favourite sister, and joined him in Egypt. She desired also to join him in St. Helena. Some remarks as to her husband are given in the article BORGHESI. CAROLINE, grand-duchess of Berg and wife of Napoleon's well-known general, Joachim Murat, had higher attributes; she bore misfortune as a heroine. Nor did her family pass at once out of the sphere of European interests; the name of her son was one of the few sounds that appeared to move the father of the last king of Naples. The life of her husband, involving her own fortunes, is under MURAT.

The articles NAPOLEON I., II., III., narrate the history of the chiefs of the house. The events of the life of the mother of Napoleon III. may best be narrated under HORTENSE. The career of the mother of Queen Hortense and the wife of Napoleon is given under JOSEPHINE. It remains, therefore, that in this place we present short biographies of JOSEPH, LUCIEN, LOUIS, JEROME, and their descendants.

JOSEPH BONAPARTE was the eldest of the Bonaparte family. As a private citizen he must have been distinguished. In person he resembled Napoleon, only he was taller; and he preserved a graciousness to which, in his latter years, the emperor was a stranger. Previous to the consulate Joseph was employed on delicate missions by the Directory; nor was the administration ever slow to avail itself of the effect of his conciliatory manner, his devotion to the honour of his country, and his skill in diplomacy. It was he who virtually delivered Rome to General Berthier; he concluded treaties with the United States and Germany in 1800 and 1801; and he was chosen as representative of the French government during the negotiations that led to the so-called peace of Amiens. Joseph wore two crowns—that of Naples and afterwards that of Spain. The two important incidents of Joseph's life, his Italian and Spanish usurpations, are those which, while revealing most concerning his personal qualities, throw the greatest light on the character and policy of Napoleon, and help us to the origin of those grand crimes that issued in his destruction. After declining the honour of a new kingdom of Upper Italy, Joseph was sent to Naples at the head of an army in 1806. The conquest of that misgoverned state was easy, nor does it appear that any order of persons belonging to it—nobles, clergy, or people—had a thought of regret at the expulsion of Caroline and that wretched Sicilian branch of the Bourbons. Joseph entered on the functions of royalty, indeed, under conditions the reverse of unfavourable. His own resolve was to govern well, to secure the safety of property, the stability of commerce, and equity in all public relations and transactions among the people he had undertaken to rule. In minor details connected with this enterprise he may sometimes have been injudicious, and sometimes have failed; but the obstacle of which his sagacity appears not to have warned him—the obstacle that neither wisdom nor philanthropy could remove—lay

in the mind and objects of Napoleon. The letters published in Joseph's posthumous memoirs are among the most remarkable that have seen the light in any age. The activity of the emperor, unless perhaps in the case of Caesar, is unparalleled in history. In the midst of the morasses in the north of Europe, and requiring to deal every hour with pressing circumstances that bore directly on the destinies of the Old World, he yet could think of the smallest details connected with the government of Naples, and felt disposed to issue regarding them very absolute decrees. Napoleon had no idea save one—"The wealth, the power of every subjected state must subserve the purposes of France; and all kings and governors are my lieutenants." He writes, "Mon frère, je vois que vous promettez de n'imposer aucune contribution de guerre. . . . A mon avis, vous prenez des mesures trop étroites. Mettez trente millions des contributions sur le royaume de Naples; payez bien votre armée. . . . Vos proclamations aux peuples de Naples ne sentent pas assez le maître. . . . Vous vous fiez beaucoup trop aux déclarations qu'ils vous font. . . . Quel amour voulez-vous qu'ils ait pour vous un peuple pour qui vous n'avez rien fait? . . . Ces gens-là s'ennuieront, et croient n'être pas conquis. Tout peuple étranger qui a cette idée n'est pas conquis. . . . Souvenez-vous de ce que je vous dis: le destin de votre règne dépend de votre conduite à votre retour de Calabre. Ne pardonnez point; faites passer par les armes au moins six cents révoltés: ils n'ont créé un plus grand nombre de soldats. Faites brûler les maisons de toute des principaux chefs de villages, et distribuez leurs propriétés à l'armée. Démariez tous les habitants, et faites piller cinq ou six gros villages, de ceux qui se sont le plus mal comportés." After reading such revolting orders, orders to a crowned monarch too! how will marvel, and still fewer lament, that the artificial fabric all fell with Napoleon. On the 9th of July, 1808, with great reluctance, by the imperative command of Napoleon, Joseph left Bayona on his entry into Spain, of which country he had been proclaimed king on the 6th of June previous. He had only entered on Spanish soil before making the discovery that every one of the circumstances which rendered a French rule then possible in Naples had here its opposite. Although exasperated with the queen-mother, his favourite, Godoy, the Spanish people looked with affection on young Ferdinand VII. and their long hereditary traditions. The good sense, the tact, and the humanity of Joseph speedily diminished the amount of his brother's fatal error; but he failed to dissipate his brother's fusions, already planting in Ferdinand's mind the rock of St. Helena. Joseph writes very early—"Sire! Personne n'aurait soupçonné toute l'invincibilité que j'aurais. Le fait est qu'il n'y a pas un Espagnol qui se montre pour moi excepté le petit nombre de personnes qui ont assisté à la prise de Madrid et qui voyagent avec moi." And again, "Je ne suis point occupé de ma position, mais elle est unique. C'est tout ce que je n'ai pas le moyen d'être parti." And in August, after he had fully acquiesced himself with the position of affairs, he writes, "Votre gloire, sire, déhonora le pays." Had not Napoleon been blinded by good fortune, he would soon have afterwards made personally into Spain, to have been satisfied him of the fidelity of his brother's people, as it was, he subjected 200 leagues of territory, but did not win one adherent; his triumphal entry into Madrid did not concern Joseph's throne, it merely opened a route as far as the Pyrenees. Unable to silence the remonstrances which duty constrained the brother—none then, indeed, to do, Napoleon trampled alike on them and their author. His marauding generals felt little of Joseph's remonstrances—certainly they had not a touch of his sense of justice. Napoleon accordingly sent orders to these men directly; and his brother had the mortification of finding himself a king with no people to follow him, and nominally at the head of an army which

he had no power to direct in the most trifling point of strategy. After Vittoria Joseph retired to France, but made some little difficulty about abdicating, when called upon to resign his crown in favour of Ferdinand VII. by his imperial brother and master. At Napoleon's fall he retired to Switzerland, but rejoined him during the Hundred Days. After Waterloo Joseph generously offered Napoleon his own vessel; but as this was declined, he sailed for America, where he lived near Philadelphia as Count de Survilliers, much esteemed, dispensing a kindly and sumptuous hospitality on the banks of the Delaware. In 1832, he came to England, and in 1841 was permitted to join his wife at Florence, where he died in 1844. Joseph was the only brother to whom Napoleon was personally attached.

LUCIEN BONAPARTE, next younger brother of Napoleon, was born at Ajaccio in 1775. He emigrated to Marseilles with the rest of the family in 1793. He entered warmly into the revolutionary notions of that period. Soon afterwards he obtained employment in the commissariat at St. Maximin, a small town of Provence, where he married the daughter of an innkeeper. In 1796 Lucien was appointed commissary at war, probably through the influence of his brother, then General Bonaparte. In the following year he was elected deputy to the Council of the Five Hundred, and went to reside at Paris. After Napoleon's return from Egypt in October, 1799, Lucien, who was president of the council, became the active leader of those who wished to overturn the Directory. In the stormy sitting of the 19th Brumaire, he successfully resisted the motion made by several members to outlaw General Bonaparte. In fact, on this memorable day, it was Lucien's coolness which saved his brother. His conduct as minister of the interior reflected great honour on the administration of the consulate. The country was organized into prefectures by him, and the arts and sciences were liberally and thoughtfully encouraged. In 1800 he accomplished a task which to any other living statesman would have been impossible, when he drove away British influence at the court of Spain by sheer diplomacy, and reconciled at the same time Spain and Portugal. Lucien, after a time, unable to work with his arbitrary brother, retired from France altogether, and fixed his residence at Rome, where he was very kindly received by Pope Pius VII. Being fond of literature and the fine arts, his house was much frequented. After the peace of Tilsit, Napoleon repaired to North Italy at the end of 1807, and sent for his brother Lucien to meet him at Mantua. The two brothers had there a conference, in which it is said that Napoleon offered to give Lucien a kingdom in Italy, but Lucien declined accepting a crown on the terms of dependency proposed, and said that he preferred to remain in a private station. "Be it so," Napoleon replied; "you cannot have hereafter any ground of complaint against me." Napoleon paid him the compliment of desiring him to leave Europe, as his silent protest would do harm to the empire. The great ability and firm republicanism of Lucien were always a cause of fear to Napoleon.

Lucien returned to Rome, where he purchased the estate of Canino, in the province of Viterbo, near the borders of Tuscany. Pope Pius VII. created him Prince of Canino and Musignano in 1808. When the French took possession of Rome in 1809, Lucien, who had expressed himself very freely against this part of his brother's policy, was "advised" to leave that city, and he retired to his country estate. In 1810 he resolved to go to the United States, and sailed from Civita Vecchia, but was seized by an English cruiser and carried to Malta, where, after a time, he obtained permission from the British government to reside in England under surveillance. He remained in the neighbourhood of Ludlow till the end of the war, and employed himself in writing his poem of "Charlemagne." After the peace of 1814 he returned to Rome, where he dedicated his poem to Pope Pius. When Napoleon returned to France

from Elba in 1815, Lucien repaired to Paris, and advised Napoleon to offer to the Emperor of Austria, in order to detach him from the allies, to abdicate in favour of his son. After the loss of the battle of Waterloo, Lucien spoke eloquently in the Chamber of Deputies in favour of his brother, but ineffectually; and he then advised his brother to dissolve the Chambers, since he could not manage them, and to assume the dictatorship. Napoleon hesitated, and at last refused. Soon afterwards the allied armies made their appearance, Napoleon went to Rochefort, and Lucien retired to Canino. He subsequently revisited England, where he published several of his works, and then returned to Italy, where he died in 1810. His estates yielded a rich crop of gems and antiquities under his explorations. Lucien ranks as a French author in prose and verse. He was undoubtedly the cleverest member of this talented family; and used his great natural powers for loftier and purer aims than his brothers. He was the only one who was able to withstand Napoleon, since, although he had not his all-mastering ambition and imperiousness, he was fully his equal in intellect and his superior in moral tone.

His eldest son, Charles Lucien Bonaparte (1803-57), well known as a naturalist, and author of the "Ornithology of the United States," and of the splendid "Iconografia della Fauna Italiana," succeeded to the title, which his son Joseph Lucien, grandson of the subject of this article now holds. Another son, Prince Louis Lucien, is a distinguished philologist, one of the great authorities on the local dialects of his adopted country, England. Another, Prince Pierre, has lived a troubled life of adventure. He was a perpetual source of disquiet to his uncle, Napoleon III., and his career culminated with the terrible affair of Victor Noir, the young journalist, whom he shot when he called upon him to arrange preliminaries for a duel with another literary man. After this Pierre retired to London, having probably done more to damage the prospects of the dynasty than was accomplished by any other single person.

LOUIS BONAPARTE, king of Holland, was born in 1778; died in 1846. Louis was a quiet, unobtrusive man, given somewhat to sentiment, and as keen an admirer of Rousseau as his great brother once was. He was an author likewise, his works being a rather weak novel, "Marie, ou les Peines de l'Amour;" a thoroughly good and candid account of his own government, "Documents Historiques et Réflexions sur le Gouvernement de la Hollande;" a "History of the English Parliament," some poetry, &c. After having been obliged, by the fiat of Napoleon, to surrender an early and sincere attachment, he married unwillingly HORTENSE BEAUFARTE, daughter of JOSEPHINE. They separated soon, and were finally divorced; it is certain that their life together was not a happy one, and grave suspicions have always fallen on the brilliant Hortense on the point of fidelity to her spouse. Three children were born to Hortense in wedlock, viz. Napoleon, who died in 1807, after having been designated by the emperor as his successor; Napoleon Louis, who died in 1831; and Charles Louis Napoleon, afterwards NAPOLEON III. Louis Bonaparte was educated for the artillery at Chalons, and took part in his brother's Italian and Egyptian campaigns. In 1806 Louis was offered by the States-general the title of King of Holland. The offer was made under dictation, but had Louis been free the people of that country would never have regretted their choice. He was not inferior in his sense of duty to Joseph; and he felt, after accepting its crown, that Holland was his country, not France. Nothing could well be in greater discord with the notions and policy of his brother, who accounted him only as a lieutenant, whose first duty was submission.

He angered the emperor by declining to sacrifice Holland and accept the crown of Spain, and minor disagreements on matters which touched the honour of Louis were fast consolidating into a permanent coolness, when

an event occurred that left the King of Holland no choice or alternative. The wealth and importance of that country have ever come from its commerce; and of all successful or lucrative commerce freedom of exchange is a prime and indispensable condition. Urged by his insane hatred of Great Britain, and utterly miscalculating his forces, the emperor established what was termed the "Continental system"—a blockade of the entire Continent against British commerce. The decree was hardly more than waste paper, as a blockade could not by any means be made effectual over so large an area. The states of Holland could not, consistently with their own preservation, give assent to the destruction of intercourse with Great Britain; and Louis protested as their representative. He obtained at first some concessions yielded, however, only that they might be recalled. His integrity and clear insight of his character, derived from his mother, prevailed without a struggle; and in 1810 he abdicated a sovereignty which, carrying with it no opportunity for the use of wisdom or the practice of beneficence, could have no charms for an honourable man. The effort to make the son of Louis a viceroy failed, and Holland was absorbed in France, being, in the words of Champagny, "in a manner an emanation from the territory of France, and necessary to the full complement of the empire!"

Louis Bonaparte now retired to Toplitz, with the title of Count of St. Leu. After the Russian campaign he tried to resume his kingdom of Holland, but in vain. In 1815 he took no part in the campaign, but settled in Rome, where he remained till his death (1846). The loss of his second son in 1831 profoundly afflicted him. His wife ultimately rejoined him there. Those who yet consider Queen Hortense innocent of the faithlessness almost universally imputed to her by her contemporaries, will find a brilliant and satisfactory defence of her character in the "Mémoires" of Madame de Remusat, who was one of Josephine's principal ladies.

Napoleon, in his days of power, named Joseph and Louis his successors in the empire. Therefore, on the death of Napoleon's son, the Duke of Reichstadt (Napoleon II.), and on the failure of male issue of Joseph Bonaparte, the son of Louis stood next for the crown. Of these Charles Louis Napoleon survived his brothers, and eventually founded the second empire, thus carrying out Napoleon's decree. According to natural descent, the Prince of Canino, eldest son of Lucien Bonaparte, was the head of the house at this time, being the son of the elder brother.

JEROME BONAPARTE was the youngest of the Bonaparte family, and the latest survivor of the original stock. He was born at Ajaccio in 1784. He was a man of considerable ability, but it may be doubted whether considerations would ever have weighed with him which assiduously would have been held imperative by *Madame Mère*, but which, all the world knows, were lightly esteemed by Napoleon. Jerome certainly quarrelled with the emperor also, but he settled the quarrel not quite without damage to his own honour. This prince was destined for the sea, and became noticed in the service, which he entered in 1800; but his predilections were with the army, in which he subsequently distinguished himself, and rose to dignity and command. His courage was unquestionable; nor did the emperor hold lightly by his judgment—witness the important duties assigned him on the day of Waterloo. At the beginning of his career, while yet he was in the navy, after a fruitless cruise round by Martinique, he put into New York; and here the serious complications of his private life began. Visiting Philadelphia he was smitten by the charms and worth of Elizabeth Patterson, daughter of a rich merchant of Baltimore; and he married her in 1803. They had one son, who settled in America, and became a respected and rich citizen of the Republic. The plebeian connection roused the anger of Napoleon, who, with characteristic meanness as well as tyranny, refused Madame

Jerome permission to touch the soil of France. Failing to procure a bull from the pope sanctioning divorce or separation, he carried out his resolve with the usual high hand; and, submissive to his menace, Jerome married Frederika Caroline, princess of Württemberg. He was rewarded by being made King of Westphalia, 1807, just before his marriage. Jerome accompanied the emperor in the Russian campaign, but failed to satisfy that severe taskmaster, and was dismissed somewhat contemptuously to his kingdom. On the downfall of Napoleon in 1814 he retired to Trieste, but at once joined the emperor on his escape from Elba, and took a very prominent part in the Waterloo campaign. After the fatal battle Jerome took refuge with his father-in-law, the King of Württemberg. He afterwards lived some time in Italy, returning to France, under permission, in 1847. Alone of his family, Jerome lived to witness the striking temporary reversal of its calamities. On the occurrence of the revolution of 1848 he hurried to Paris at the head of scions of his house, who had been living and well-nigh lost in obscure haunts over the world; and he found himself received by France with open arms. In the first National Assembly he read the names, as representatives, of Pierre, third son of Lucien; of his own son Napoleon, usually called "Prince Napoleon (Jerome)"; of Napoleon Charles Lucien Mout, formerly a lawyer in New York, son of Caroline Bonaparte; and lastly of Charles Louis Napoleon, sole surviving son of Louis Bonaparte, then apparently for the first time in the straight road to power. He lived to see the gift of the purple to the latter as NAPOLEON III. Jerome was made governor of the Invalides, president of the Senate, marshal and prince of France. He died in 1860. His son, "Prince Napoleon" (Napoleon Joseph Charles Paul, born in 1822), after the failure of Napoleon III.'s line in the Prince Imperial, became the head of the evil house, and feebly sustained his part of pretender in an abortive proclamation at the beginning of 1883.

The literature relating to the Bonaparte family, exclusive of that specially devoted to the two emperors, is enormous in mass. The "Mémoires of Madame de Remusat" (translated into English, 1882) are extremely valuable for family relations. Du Cassé's "Memoirs of King Joseph" (ten vols. 1851); Melito's "Mémoires of Lucien" (1836); King Lou's work on Holland, before mentioned; and Du Cassé's "Memoirs of King Jerome," are also indispensable works.

BOND. A bond or obligation is a deed by which he who makes it, called the *obligor*, binds himself to another, called the *obligee*, to pay a sum of money, or to do, or not to do, some particular act. Bonds are employed instead of promises by word or by unsealed writing, for the following reasons—First, a bond (like every covenant) to pay a sum of money may be enforced against the obligor, although no legal *consideration* existed for making it; and accordingly voluntary engagements which are intended to be binding should be made by bond or covenant. Secondly, even if the sum of money which a person obliges himself to pay is a debt already existing, or if any legal consideration for its payment exists, so that a promise by word or by unsealed writing to pay it would be binding, yet a bond is a better security: for if the debtor dies before the debt is paid, the creditor, being by virtue of the bond among those who are called creditors by *specialty*, will be entitled to be satisfied out of the personal and real *ASSETS* of the deceased before creditors by *simple contract* receive any part of the debts due to them. In order, however, that a bond debt may be thus payable out of the *real assets* of the debtor (his lands of which he died *seized*) before his simple contract debts the debtor must, by the bond, have bound himself *and his heirs* to pay the debt.

An action may be brought upon a bond at any time within twenty years after it is due; but a simple contract debt is

barred by the statute of limitations after six years. See **STATUTE OF LIMITATIONS**.

A bond in England cannot be *assigned* in law, so as to give the assignee the right of suing, in his own name, the obligor for the debt. But courts of equity support assignments of bonds to purchasers, and enforce the right of such to receive the bond debts out of the *assets* of the debtors.

When a man agrees to do, or not to do, some particular act, he often enters into a bond for payment of a certain sum of money, as a penalty, in case he departs from his agreement. A bond of this kind, which is called a *penal bond*, is a bond for payment of the penal sum, no time or event being mentioned when that shall be due; but a *condition* is added for making the bond void, in case the obligor performs the duty which is expressed in the condition. If the condition in a bond be impossible, the condition alone is void, and it becomes a *single bond*, *i.e.* a bond without consideration, though if the condition be illegal, both bond and condition are void. If, however, a bond contain both legal and illegal conditions distinct from each other, the general rule is that the latter only shall be void. Generally, when a bond for payment of a sum of money mentions no time of payment, an action may be brought upon it immediately; yet in this case the penal sum is not considered to be due or recoverable till the condition annexed to the bond fails by the obligor not doing or doing the particular act which is expressed in the condition. When the obligee in a penal bond recovers the penalty, he cannot generally take more of it than what is a reasonable compensation for the damage sustained by him; and the amount of such compensation will be ascertained by the verdict of a jury.

It is a general rule that the obligee cannot recover upon his bond any pecuniary compensation beyond the penal sum which is mentioned. But, according to the construction of penal bonds in a court of law, a condition for making a bond void, in case the obligor does or does not do some particular act, shows an agreement by him to do or not to do such act; and this agreement will, in many cases, be enforced against him, at the suit of the obligee, by a decree for specific performance of the agreement, or by an injunction against its breach; and thus, even where the penalty in a bond is insufficient, the obligee is not always without remedy.

Courts of law do not consider that an implied *covenant* is created by the condition of a bond, so as to allow the obligee to bring an action upon it; but they so far take the condition to be evidence of a contract upon which the bond is founded, as to hold the bond to be void if the condition is unlawful.

On this subject the law of Scotland differs in many respects from that of England. In Scotland a bond may be defined to be a written obligation to pay or to perform, and is as various in its nature as the circumstances to which it is applied. The obligor is generally termed the obligant or grantor, and the obligee, the receiver or grantee—very often the terms debtor and creditor are employed. Bonds are generally divided into movable and heritable. *Movable*, termed also *personal bonds* are simple personal obligations to be fulfilled either directly or conditionally, as for example in the event of some other failing to pay or perform. The following are the most ordinary forms:—Bond for repayment of a sum of borrowed money; bond of caution—*i.e.* suretyship; bond for a cash credit in a bank; bond for payment of an annuity; bail-bond, &c.—all of which sufficiently explain themselves. A bond is not void from want of consideration, but it may be avoided if granted for an immoral consideration or as a cover for fraud. Bonds generally contain a clause of registration for execution, the effect of which is to enable them to be enforced without raising an action. Movable bonds are transferred by assignment, and descend to

executors unless taken payable to heirs. The rules as to construction and enforcement of penalties in bonds are now much the same in Scotland as those followed by courts of equity in England. A *heritable bond* is a bond for a sum of money, to which is joined in further security a conveyance of land or heritage. This may be termed the Scotch mortgage. In its modern form of a bond and disposition in security—statutory styles for which have recently been provided—it is perhaps the best mode of utilizing real estate as a fund of credit hitherto invented. As it must enter the register, the extent to which the borrower's lands are already burdened can always be ascertained; and as it contains a form of sale, the creditor need seldom lie long out of his money. Registration also does away with all necessity for delivery of the title-deeds to the creditor. The simplicity of the whole procedure for constituting, conveying, and extinguishing the security is most beneficial to both borrower and lender. There is another form, by absolute disposition and back bond; but this, though useful for certain purposes—for example, continuous advances—is not in general so convenient. Heritable bonds, though charges against the heirs of the debtor, descend to the executors of the creditor, unless otherwise provided for in the bond. (See 31 & 32 Vict. c. 101, s. 107.)

BONDED GOODS are those deposited in approved warehouses until the crown's duties thereon are paid.

BONDU' or BONDOUT, a kingdom of West Africa, situated to the W. of Bambouk, between 11° and 15° N. lat. and 11° and 13° W. lon. The surface of the country is an elevated plateau, with hills in the southern and central portions. The country is watered by tributaries of the Gambia and Senegal, and is very fertile; rice, cotton, indigo, tobacco, grains, and various fruits are cultivated. The religion of the people is Mohammedan. Park was the first European traveller to visit the country. Population, about 1,500,000.

BON'DUC SEEDS are produced by a tropical climber, *Cesalpinia bonducella*. They are used in India in intermittent fevers, and for general debility; the root and bark are even more valuable, but are only beginning to come into use. *Cesalpinia* belongs to the order LEGUMINOSÆ. The seeds are of a greenish-gray colour, hard and shining, about half an inch in diameter, and inclosed in pods. The plant climbs over others by means of hooked prickles on the stalks of the leaves. It is distributed generally throughout the tropics. See *CESALPINIA*.

BONE is that hard and yet elastic, solid and yet light substance which forms the framework of the body of the higher animals. The bones—that is, the separate structures made of this material—serve chiefly therefore mechanical purposes in the body, and the numerous ways in which they are thus serviceable require that they should be of different sizes and forms. In the human skeleton there are commonly enumerated 260 different bones, which present every variety of size and figure. Several of these run together in later life, however—thus the twenty-fifth to the twenty-ninth vertebrae of the backbone unite to form the *sacrum*; the next four run into one bony mass called the *coccyx*, &c. Again, in an adult skull there are twenty-two separate bones, but in that of a child there are many more, and in that of an aged person not nearly so many. Some bones are long and round, as the bones of the upper and lower extremities; others broad and flat, as the bones of the skull, or the shoulder blade, &c.; and others short and square, as the separate bones that compose the vertebral column, wrist, &c. The structure, disposition, and connection of the individual bones accomplish in the most perfect manner the following mechanical uses:—1. By their hardness and firmness they afford a support to the soft parts, forming pillars to which the more delicate and flexible organs are attached and kept in their relative positions. 2. By the same properties of hardness and

firmness they defend the soft and tender organs, forming solid and strong cases in which such organs are lodged and protected, such as the case formed by the bones of the cranium for the lodgment and protection of the brain; that by the bones of the vertebral column for the lodgment and protection of the spinal cord; and that by the bones of the thorax, for the lodgment and protection of the lungs, the heart, and the great vessels connected with the latter. 3. By affording fixed points for the action of the muscles they serve as levers, to expand the chest, to move the head and limbs, &c. By their motion of separate parts and locomotion of the whole body are rendered possible; and at the same time the firm articulation gained by bony joints ties all the parts of the frame firmly together, while free play of movement is allowed.

In chemical composition bone is found to contain two-thirds of earthy matter to one-third of animal matter. The first is calcium phosphate, or what used to be called "phosphate of lime," with a smaller quantity of carbonate of lime, but there is five times as much of the phosphate as of the carbonate. (There are present also, in very small proportions, calcium fluoride, magnesium phosphate, and common salt.) The second, or animal portion of bone, is resolved into gelatine by boiling. Both these constituents are intimately united; so that when by acids the earthy matter is dissolved out, or when by heat the animal matter is dissipated, in each case alike the form of the bone is preserved. The average proportion between the two constituents in the adult is two to one as above given; but in infancy the animal part is relatively so much greater that the bones are no stiffer than gristle, a condition which, if permanent, results in the disease called rickets; on the other hand, in old age the earthy part is so much in excess that the bones become very hard and brittle. Also the different bones of the body vary much in their structure in this particular; the petrous portion of the temporal bone (which contains the inner EAR) is the hardest—that is to say, it has relatively the most earthy matter of all the bones in the body; and the breastbone is the softest—that is to say, it has relatively the least earthy matter. The breastbone is described in the article **BACKBONE**.

Bones not only differ from one another in their comparative hardness, but no two bones possess the same degree of rigidity, and no bone is equally hard in its entire substance. When a section is made of the head of a long bone, such as those of the arm or leg, in such a manner as to show its structure throughout, the substance is seen to consist of an exterior hard or compact part, and an interior avicular or spongy part. The hard compact outer part of the bone forms a completely solid body, exhibiting scarcely any visible arrangement, without apparent fibres and laminae; but towards the inner part of the bone the substance becomes less and less dense, until at length it presents the appearance of minute and delicate fibres, which intersect each other in every direction, forming the cells termed *cancelli* (lattice-work). The transition from the compact to the spongy part is not marked by any distinct boundary, but the one passes into the other by insensible degrees, showing that there is no essential difference between them; and indeed the microscope shows that, although in the densest part of the bone there is no specific organization visible to the naked eye, it is made up of fibres and plates perfectly similar to those of the spongy or cancellated part, differing from it principally in its greater degree of condensation. In the shaft of the bone there is scarcely any of the spongy matter; but a hollow space is left, which is filled up with a series of membranous cells in which the substance called marrow is lodged. This is called the medullary cavity, from *medulla*, marrow.

If a flat bone, such as the shoulder-blade, be examined in the same manner, it is found to contain a layer of the

cancellous or spongy structure sandwiched, as it were, between two layers of compact hard bone; and in "square" bones, such as those of the wrist, a thin hard shell is filled with a cancellous interior.

All bones are covered (except where they have articular surfaces) by a membrane named, on account of its affording them an external envelope, the *periosteum*. The outer surface of this enveloping membrane is connected with the surrounding parts by cellular tissue, but its inner surface is firmly adherent to the substance of the bone. This adhesion is effected by innumerable fibres or threads, which on examination are found to consist of bloodvessels. The periosteum is, in fact, the membrane on which the nutrient arteries of the bone rest, divide, and ramify, in order to enter the osseous substance. The inner surface of the "long bones" is also lined by a delicate membrane, commonly termed the internal periosteum, the continuation of which forms the membranous bags in which the yellow marrow is contained.

The marrow contained in bones is of two kinds—the *red marrow*, which fills the cancellous structure, highly charged with bloodvessels, and so nourishing the bone, the interstices of which it fills; and the *yellow marrow* of the medullary cavity of the long bones, which in infancy does not exist, any more than the cavity which contains it.

If the human embryo be examined at a very early period of its existence, the parts destined to become bone are found soft, gelatinous, and semi-fluid; but the figure of several of the larger bones can already be distinctly traced. By degrees these masses are observed to acquire more consistency; and at length pass from a soft and semifluid state into that of a solid and firm substance without any apparent structure, but containing cells grouped together in patches, which assumes the appearance and exhibits the properties of cartilage. This hyaline cartilage, at first transparent and colourless, after some time exhibits in different parts of its surface opaque whitish spots, which, when examined by the microscope, are found to consist of a number of delicate lines, which progressively increase in size and density. Red points are also to be seen, dispersed through them, indicating that the bloodvessels of the parts are so much enlarged as to be capable of admitting the red particles of the blood; and now particles of bone are copiously and rapidly deposited, insomuch that the parts which were recently elastic soon become hard and rigid. Thus the first depositor of bony particles takes place in cartilage. The cartilage, which forms the earliest nucleus for the bony particles, does not remain as a permanent part of the bone, but is carried away by the absorbent vessels in proportion as the true osseous matter comes to be deposited, and is replaced by the latter, which is a totally new deposition of animal matter, and subsequently forms a constituent part of the permanent bone. The bone gradually advances towards perfection in the course of its growth, the general proportions of the parts being still preserved, and the finished bone exhibiting prominences and depressions in the same relative situation as at first, having not only similar internal cavities, but being frequently excavated in parts which were before been solid. Cells are excavated by the action of the absorbent vessels, which carry away portions of bony matter both in the axis of the cylindrical or in the middle layer of the flat bones. Their place is supplied by an oily matter, which is the marrow. As the growth proceeds, when new layers are deposited beneath the periosteum, on the outside of the bone and at the end of the long bones, the internal layers of calcified or imperfect bone near the centre are removed by the absorbent vessels, so that the cavity is further enlarged. In this manner the outermost (calcified) layer of the young bone gradually changes its relative situation, becoming more and more deeply buried by the new layers which are successively deposited, and which cover and surround it, until, by the removal of all the

layers situated near to the centre, it becomes the innermost layer, and is itself destined in its turn to disappear, leaving the new bone without a single particle which had entered into the composition of the original structure.

Not all bones, however, are preceded in this manner by cartilage. The "flat bones," as those of the skull, &c., are developed by "ossification in membrane," as distinguished from "ossification in cartilage" just explained, the great distinction being that they do not pass through the curious preparatory stage described above—the *calcification* or formation of a species of false bone, destined to entirely disappear before *ossification*, or the formation of true bone—but are formed direct from the inner surface of the membrane or periosteum occupying their place in the embryo.

The minute structure of bone is very beautiful and interesting; and however bones may differ in function, appearance, or mode of ossification, they all present certain definite characters under the microscope. A section either along or across the bone shows a number of tiny spaces or *lacunae*, containing tiny morsels of protoplasm, or *bone corpuscles*, each of which communicates with the neighbouring bone corpuscles by branching fibres traversing the *canaliculi* or small channels uniting the lacunae. A transverse section shows the bone to be mapped out into circular sections, each surrounding a space which is the section of a canal running the length of the bone. The substance of the bone is perforated lengthwise by a number of these canals, called *Haversian canals*, from their discoverer, Wm. Havers (1691). The function of the Haversian canals, which are about $\frac{1}{60}$ inch in diameter, is to receive the bloodvessels which enter the bone by the numerous perforations beneath the outer membrane or periosteum, and nourish the bone by providing materials to be absorbed by the bone corpuscles in the surrounding lacunae. For a transverse section also reveals the fact that these lacunae are arranged in concentric layers, each system round one of the many Haversian canals as its centre. The ultimate structure of bone is found to be in lamellae, which surround the Haversian canals like the annual layers of the woody fibre of a tree.

Centres of ossification are generally three in a long bone—one for the shaft, and one for each extremity. It has been proved that when the shaft is once fully formed, the bone grows in length at the two extremities, not (as might be supposed) evenly throughout its length. It increases in thickness by the deposit of successive outer layers under the periosteum. Besides these principal centres of growth, there are subsidiary points of ossification for the *processes* for muscular attachments, &c.

In man bone is only formed from hyaline cartilage or direct from the membrane; but in the animal kingdom generally, other varieties of connective tissue may become ossified, as the tendons in some birds.

The articular surfaces of bones are beautifully covered with a smooth glistening bluish-white structure called *articular cartilage*, almost annulling friction, and acting as a buffer between the two connecting bones. Besides this the joint is lined by a peculiar folding membrane called the *synovial membrane*, the office of which is to secrete the glairy fluid named *synovia*, wherewith to lubricate the joints, spreading out between the articulating surfaces. Further, such exposed points as the knee or the hip-joint, where there is continual friction of skin or muscle on the surface of a bone, are always protected by a synovial membrane in the form of a little pad or bag, called a *bursa*. For further information about the manner in which bones are connected together, see *ARTICULATION*. The use of the bones as levers, and their function as the framework of the body, will be found treated of under *SKELTON*.

BONE (in manufactures). Bone is one of the most useful substances we have. Under the articles *BONES* (as manure) and *BONE-BLACK* are described some of its

uses as developed by treatment of various kinds. Its hardness and lightness make it also valuable in its unaltered form; and as knife handles, buttons, combs, brush handles, and many toys and ornamental articles, it is very useful and familiar. Ivory is but a splendid variety of bone. So largely was bone formerly used amongst our rude and savage ancestors in the remote prehistoric past, that one age of the world is sometimes known as the *bone age*, from the numerous relics of fish-hooks, arrow-heads, combs, bodkins, needles, drinking cups, buttons, and ornaments of many kinds discovered by our archaeologists, especially amongst the remains of the lake-dwellings in Switzerland. These productions are coeval with the *bronze epoch* of another system.

From the boiling down of bones a valuable gelatinous substance is obtained, the produce of the animal constituent of bone. This plays a considerable part in our national economy, from the manufacture of nutritious stock for soup in the kitchen to the fine gelatines and glues of commerce, the manufacture of soap, &c.

BONE BED, in geology, is applied to a stratum of rock containing a large quantity of vertebrate remains. In Great Britain the most remarkable bone beds are--the *Ludlow Bone Bed*, a layer from 2 to 12 inches thick, at the top of the Upper Silurian series; it has been traced from Ludlow in Salop, to Pyrton Passage in Gloucestershire, and from Kington to Ledbury and Malvern. The vertebrate remains found in it consist of the spines, jaws, and coprolites of several species of placoid fish, as *Oxolus tenuistriatus* and *Pteraspis*. The bed also contains crustacean remains. The *Armagh Bone Bed* (Ireland) and a bone bed near Clifton, on the Avon (England), in the carboniferous limestone, contain numerous teeth of placoid fish. The *Rhatic Bone Bed* lies in the black shales, between the Trias and the Lias; it contains numerous fish and reptilian remains, but the most interesting are the mammalian, which are the earliest yet found; they are teeth of *Microlestes antiquus*, a small insectivorous marsupial, allied to the banded ant-eater (*Myrmecodons fasciatus*) of Australia. The beds are at Axmouth and Westbury-on-Severn.

BONE CAVES are fissures or cavities in rock masses containing accumulations of clay, sand, gravel, rock fragments, and other debris, intermingled with the bones of both living and extinct animals, and sometimes with human remains or implements. These bone deposits, which are most abundant in limestone districts, generally open on the brow of a hill or escarpment. Originally they were caverns or large open fissures (often occupied by subterranean rivers), which are now either wholly or partially filled with debris of a most heterogeneous character. There are well-preserved and fragmentary remains of almost all classes of mammals, both small and great, as rats, weasels, the mammoth, and cave lion, mingled with earth and gravel, and often forming an unstratified *bone, rubbish, or bone breccia*. In many cases, however, distinct layers of this deposit can be distinguished, representing separate stages or periods in its accumulation. Under the more recent deposits the uppermost layer usually consists of a stalagmitic crust, or of a calcareous breccia; beneath this is the *cave earth*, usually a reddish loam, and containing the animal remains. Of those found in British bone caves may be mentioned the mammoth, rhinoceros, hippopotamus, cave lion, cave bear, and cave hyena, a large tiger with tusks 10 inches in length (*Machairodus latidens*), the glutton, Irish elk, &c., besides the brown and grisly bears, bison, beaver, reindeer, and many other living species that have been long extinct in the British Isles. Human remains and rude stone implements of both the Paleolithic and Neolithic Age have also been found in deposits associated with the rhinoceros, cave bear, and lion, at the Pin Hole and Robin Hood Caves, with the hippopotamus and el-

phant at the Victoria Cave, and with the Irish elk at Ballinamintre Cave, Waterford. In Great Britain most of the caves occur in either Devonian, Carboniferous, or Permian limestone. Many have been systematically explored, amongst them being Kirkdale Cave (Yorkshire), Victoria Cave, near Settle, Kent's Hole and Brixham Cave, near Torquay, and Cefn (Flintshire). In Ireland caves have been systematically explored in three localities with good results, as the Shandon and Ballinamintre Caves, Waterford, and the Knockmore Caves, Fermanagh. Along the shores of the Mediterranean caves occur in nummulitic limestone at various heights above the sea; they have been explored at Malta, Gibraltar, and some other places.

The origin of these accumulations is a matter of conjecture; it probably varied in different localities. In some cases the caves were the dens of large carnivores, who carried their prey there to devour it, leaving the bones broken and gnawed. Sometimes the remains appear to be those of animals that crawled in to die; in others they are rounded and water-worn, as though they had been drifted about and accumulated by water, or they are broken and crushed as though the animals had tumbled into them as into a pitfall. At other times these caves were the habitations of man, who prepared in them his weapons and cooked his food. At the Knockmore Cave, which open towards the east, human remains have been found at the entrance bearing evidence of having been roasted with fire, but whether for sepulchral, sacrificial, or culinary purposes it is difficult to determine.

BONE, HENRY, R.A., was born in Truro, Cornwall, in 1755, and died at London in 1831. He brought the art of enamel painting to a degree of excellence previously unknown in this country, and was justly rewarded by being successively appointed enamel painter to George III. George IV., and William IV. His large enamel of "Bechus and Ariadne" (purchased by the nation for 2200 guineas) is the chief treasure of the National Gallery in that branch of art; and a series of eighty-five portraits of Elizabethan celebrities (unfortunately dispersed at his death, as the government declined to purchase at the price offered, £5000) was considered his greatest work.

BONE-ASH or BONE-EARTH consists of the earthy material of which bones are composed after the gelatin has been consumed by means of combustion in an open furnace. It should contain about 80 per cent. of phosphate of lime, the remainder being made up of carbonate of lime, phosphate of magnesia, soda, and salt. Large quantities of this material are imported from South America, and bone-black, after it has been used in the refining of sugar, is utilized for the same purpose. Bone-ash is used for making cupels for assaying, and as a polishing powder for plate, but its chief use is in the manufacture of artificial manures. (See BONES, in name.)

BONE-BLACK or ANIMAL CHARCOAL is obtained by means of the destructive distillation of bones, and consists of one part of pure charcoal to nine parts of the phosphate and carbonate of lime. The bones used for this purpose are inclosed in iron vessels, and exposed for some hours to the red heat of a kiln, by which means the water, oil, combustible gases, and vapours of the various salts of ammonia, which amount to about two-fifths of the weight, are driven off, and the bone-black left in the retort.

It possesses in an eminent degree the power of absorbing the coloring matter contained in the solutions of organic compounds, and is largely used in the clarifying of sugar, and in making water filters. It is also very useful as a deodorizing agent, possessing a great power of absorbing noxious gases. When by reason of use in either capacity it becomes inactive, it may be subjected to a process of revivification, and be cleared and rendered useful again by being treated with acid or water, or by being carefully exposed to a red heat while confined in a closed vessel.

The process can, however, only be repeated for a limited number of times, as it causes the bone-black to gradually lose its absorptive power. Ivory black is obtained by grinding bone-black to a fine powder, mixing it into a paste with water, which is afterwards dried and used as a pigment.

BONES (as manure) have been of late years very extensively used, especially on poor and dry sands and gravels. When crushed and used judiciously, the advantage of bones as a manure, in distant and uncultivated spots, where the carriage of common stable or yard manure would have been too expensive, and where it could not be made for want of food for cattle, is incalculable. By means of bones large tracts of barren sands and heaths have been converted into fertile fields.

The bruising or grinding of bones has become a distinct business, and they may be bought in London and at the principal ports ready to put upon the land. They are broken into different sizes, and are accordingly called *inch bones*, *half-inch bones*, and *bone dust*. Most of the bones procured from London and the manufacturing towns have undergone the process of boiling, by which the oil and a great part of the gelatine which they contain have been extracted.

Bones consist of about one-half animal matter; the rest being phosphates of lime and magnesia, and carbonate of lime. They derive their fertilizing property mainly from the phosphate of lime, but in part also from the mechanical texture of the bones, and their power of absorbing and retaining moisture, which enables the plants to feed on the decomposed gelatine of the bones. The effect of bones on the crop is much increased when they have been previously mixed in heaps with ashes, burnt clay, or light loam, or made into a compost with the dung of animals, and with vegetable substances. The mode of applying bone manure to the land is either by sowing from 20 to 40 bushels of them per acre by the hand broadcast, as is done with corn, and harrowing them in with the seed; or by putting them into the drills by a machine made for the purpose, which is an addition to the common drilling machine. This is the most approved method, and the crop for which they are best adapted is turnips, after the land has been well cleaned and tilled. About 25 bushels per acre is sufficient to produce a good crop on poor light sands, and it does not appear that beyond this quantity they have a proportional effect. In strong loams or in very moist seasons, farmyard dung, as compared with bones, put on at the rate of from 10 to 15 tons per acre, has decidedly the advantage, not only for the turnips but for the subsequent crops. On very dry, gravelly soils and in dry summers the bones produce the best turnips; and when the comparative cost is taken into consideration, and the saving of time in the light carriage of the bones, it will be seen that the bones are much more economical. Besides this, farmyard or stable dung cannot always be procured in any considerable quantity, while bones may be had almost to any amount, if broken in proper time.

In certain geological formations immense quantities of the remains of animals, and of animal remains generally, have been discovered, which have been of great value to the agriculturists where they occur. Locally they are in a loose way named "fossil bones." Scientifically, these silicified remains of animals of the primeval world have received the appropriate name of *coprolites*, from two Greek words (*copros* and *lithos*) signifying "manure stones." They are of frequent occurrence in brown, gray, or blackish-green lumps of tolerable hardness, and are found to contain nearly as much phosphate of lime, or animal earth, as the bones of our domestic animals, which is more than 50 per cent. It was found, however, by Marchand, that the fossil bones of a trio of bears, found near the surface of the soil, contained only 4 per cent. of organic matter, while another, obtained from a considerable depth, contained above 16 per cent.

Another method of utilizing bones as a manure is by using them in a *dissolved state*, or in the form of *superphosphate of lime*. This is obtained by subjecting apatite, coprolites, bone-dust, or bone-ash to the action of sulphuric acid, the result being obtained in the form of a coarse soft powder of a dark colour. It is used alone for root crops, and when combined with sulphate of ammonia or nitrate of soda forms a valuable manure for cereals.

BONFIRE, a large fire kindled on occasions of public rejoicing, or in memory of an important event, such as the celebration, on the 5th November, held in many places to commemorate the defeat of the Gunpowder Plot. The combustibles used are such as burn readily—dry wood, tar barrels, straw, shavings, &c.; and the fire is usually made in a conspicuous place, such as the top of a hill or the centre of a village green. In former times such fires were kindled to celebrate seasons and dates (see BELTETS), and as beacons in time of war. The etymology of the word is not certain. It would at first sight seem to be from *bon* (Welsh), a beacon; but Skeat finds its earliest form to be *bone fire* or *hane fire* ("Catholicon Anglicanum," 1483), meaning a fire of bones; and certainly it was used in this sense at the dissolution of the monasteries and destruction of the relics under Henry VIII. Other authorities for this derivation are "Quatuor Sermones" (1499) and Leland's "Collectanea" (1550). Or it may simply be "bouny fire"—a jolly fire, *fiu de joie*; and this is its present meaning.

BONI, a state in the island of Celebes, on the western shores of a bay of the same name. It is about 450 square miles in area, and has an estimated population of 200,000. It was once the leading state of the Celebes, but is now practically a Dutch dependency. The inhabitants are known as Bugis. There is a trade in cotton cloth, gold dust, pearls, camphor, and medicinal preparations. Boni was held by the English for two years from 1811.

BONIFACE, the name of nine of the popes, the following only of whom have any historical prominence:—

BONIFACE I. was elected bishop of Rome after the death of Zozimus, A.D. 419. Several letters from Boniface to the bishops of Gaul, concerning matters of discipline, and to the bishops of Africa, are in Constant's collection, and give a favourable opinion of his character and learning. He asserted the authority of the Roman see over the churches of Illyricum, upon which contested point there are letters extant from Boniface to Rufus, bishop of Thessalonica. Boniface died A.D. 432, and was succeeded by Celestinus I.

BONIFACE III. was elected in March, 607, and died in November of the same year. He obtained of the Emperor Phocas the acknowledgment of the supremacy of the see of Rome over all other churches. This circumstance renders his pontificate remarkable.

BONIFACE IV. consecrated the Pantheon at Rome (608-615). **BONIFACE V.** is honourably known for his efforts to Christianize England under the Anglo-Saxons (619-625).

BONIFACE VIII., Cardinal Benedetto Gaetani of Anagni, succeeded Celestinus V. in January, 1294. He was mixed up with most of the struggles for power between the temporal princes of his day, and carried the authority of the holy see further than most of his predecessors or successors. He proclaimed the first jubilee in the year 1300, granting by a bull a plenary indulgence to all those who should visit the sanctuaries of Rome in that year. This attracted an immense multitude of foreigners to Rome. Before Boniface's time plenary indulgence had been granted only to those who went to the crusades for the deliverance of the Holy Land. The most serious quarrel of this pope was with Philip le Bel, king of France. Boniface excommunicated the king, placed his kingdom under interdict, and wrote to Albert of Austria, inviting him to make war against France. Philip assembled the states of the kingdom, and laid before them twenty-nine charges against the

pope, accusing him of simony, of heresy, of licentiousness, and even of sorcery, and appealing to a general council of the church. The next measure of the pope was to proclaim all Philip's subjects released from their allegiance. The king, resolving to put an end to this dangerous struggle, sent Guillaume de Nogaret, a bold, unscrupulous man, to Italy, with money and letters for the partisans of the Colonna, which powerful family Boniface had ruined and excommunicated. Nogaret was joined by Sciarra, one of the Colonna who had escaped from captivity. The pope was at Anagni, when Nogaret and Sciarra suddenly entered the town, followed by armed men, overcame the pope's guards, and arrested Boniface himself. Nogaret was for taking him to Lyons, where the council was to assemble, but Sciarra insisted upon Boniface abdicating, abused him, and even struck the old man with his gauntlet. Boniface behaved with dignity and firmness; he was kept three days in confinement, during which he would not take any food for fear of poison. At last Cardinal del Fiesco induced the people of Anagni to rise and deliver the pontiff, and Sciarra and Nogaret were obliged to leave the town. Boniface returned to Rome; but his health had received so severe a shock that he fell ill and died, October, 1303, after about nine years of a most turbulent pontificate. Boniface was one of the most strenuous asserters of the assumed supremacy of the pope over princes and nations in temporal as well as spiritual matters. He was an inveterate persecutor of the Ghibellines, and Dante has written of him at length in canto xxvii. of the "Inferno."

BONIFACE IX. (Pietro Tomacelli) was one of the popes during the great Western schism. The rigours of Urban VI. caused many of the cardinals to seize the pretext of great infirmities at his election as a warrant for a fresh election; and the object of their choice, the cardinal bishop of Cambray, took the title of Clement VII., and retired to Avignon, whence the papacy had only a short time before returned to Rome after its long exile. Urban remained at Rome, and was succeeded by Boniface IX. in 1389. To raise money for the struggle with Clement, Boniface exceeded the most shameless of his predecessors in the sale of benefices and indulgences, and was forced at times to part with valuable fiefs of the church. He died in 1404.

BONIFACE, ST., a native of Devonshire, was born about A.D. 680. He became a monk, and resided for a time in a convent at Southampton, where he acquired reputation for learning and piety. When thirty-six years of age he set out for Rome, where he expressed to Pope Gregory II. his wish to preach the gospel to the heathen nations of Germany. The pope having sanctioned his vocation, Boniface for more than thirty years laboured in converting and civilizing the rude natives, and he well deserved the title which has been given him of "the apostle of Germany." He founded four cathedrals, Erfurt, Bonaiberg, Aichstadt, and Wurzburg, with a school attached to each, and he established numerous monasteries both for monks and nuns. These monasteries were generally built upon uncultivated grounds, which were cleared and tilled by the new inmates, and thus agriculture kept pace with the diffusion of Christianity. Boniface was made archbishop of Mainz, and metropolitan of all the few dioceses on the right bank of the Rhine. He sent for missionaries from Britain to assist him in his difficult task. In his arduous labours he was supported by Carloman, and afterwards by Pepin, sons of Charles Martel. In 755 Boniface visited Frisia, a country still in great measure pagan. Having assembled a multitude of converts, he pitched tents in a field for the purpose of giving them confirmation, when a band of heathens fell upon the encampment, and killed or dispersed the congregation. Boniface was among the killed. His works, which consist of letters and sermons, and an historical commentary on his own times, were published in two volumes (London, 1815). The letters and

sermons had previously been published at Paris in 1605, and at Mainz in 1789.

BONIFACIO, a seaport town and fortress in Corsica, in the arrondissement of Sartene, stands on the extremity of a rocky peninsula, 200 feet above the sea, at the western entrance of the Strait of Bonifacio. It is a place of considerable trade in corn, olive-oil, wine, coal, &c., and has a population of 2790. The caverns and grottoes below the town are very curious and extensive.

The Tuscan marquis Bonifacio founded the town in 823, and a large tower of that date still remains. It came at different times into the possession of the Pisans, and into that of Genoa. Faithful to the latter state, the town made a brave defence against Alphonso I. of Aragon in 1420.

BONIFACIO, STRAIT OF, divides Sardinia from Corsica. The narrowest part, between Longosardo in Sardinia and the southernmost point of Corsica, is about 10 miles wide. At the east entrance of the strait are several clusters of islands. Near the Corsican coast is the island of Cavallo; and between that and Maddalen on the Sardinian side is Santa Maria, with several other islets and rocks, which make the Mediterranean sailors in general avoid passing through the strait. The land on both sides of the strait is mountainous. The Strait of Bonifacio is the *Fretum Gallicum* of the ancient Romans. It takes its modern name from the small town Bonifacio in Corsica.

BONINGTON, RICHARD PARKES, was born in the village of Arnold, near Nottingham, in 1801. Bonington's father was a landscape and portrait painter, and perceiving a strong tendency in his son towards his own pursuit, he trained him from his childhood in such a manner as in his judgment was best calculated to fit him for his future profession. Bonington's professional education, however, was chiefly French, and procured him permission to study in the Louvre.

Having obtained a considerable reputation in Paris by his works, which were chiefly marine and coast view, he visited Italy. Venice afforded to Bonington particular attractions. The master-pieces of the dual palace and of the grand canal, which were exhibited in England and attracted much notice. They are painted somewhat in the style of Canaletto's works. It was his intention to paint many other similar pictures, of which he had already prepared the sketches, when he became the victim of a fatal disease. He died in London, shortly after his return from a second visit to Paris, in September, 1828, having not quite finished his twenty-seventh year.

BONITO is a name applied to several members of the mackerel family (Scombridae), of the order ACANTHOPTERYGII. The best known, *Thynnus pelamys*, sometimes called the Striped bellied Tunny, is a denizen of all the tropical and temperate seas, and has been found occasionally on the British coasts. It is noted for its activity and voracity, and pursues the flying fish with unrelenting hostility. The body is of a steel blue tint, and four dark-brown stripes are found along each side of the belly. In its form it resembles the tunny, but is more slender, and rarely exceeds 3 feet in length. Its flesh is relished by sailors, who catch it by means of an imitation flying-fish. Another species, *Thynnus sarda*, is common in the Atlantic Ocean and Mediterranean and Black Seas. It is about 2 feet long. As in the tunny, the scales of the pectoral region form a corslet. There is a keel on each side of the tail. The Plain Bonito (*Auriss pelagus*), common in the Atlantic, Mediterranean, and Indian Ocean, differs from these in having minute teeth in the jaws only and none on the palate. The body is of a uniform blue colour, without stripes.

BONN, a town in the Cologne circle of the Prussia Rhine-province, 16 miles by railway S. of Cologne. It stands on a gentle eminence on the left bank of the Rhine, which is here crossed by a flying-bridge, and in 1889 ad

a population of 32,000. The town has rather a modern look. The houses are substantially built, but the streets are narrow. Bonn is of a circular form, and it has five gates; the buildings, however, are extending outside of these. It contains several squares; of these the Münster square, which is planted with trees, is the finest. The Münster or cathedral church is a Gothic structure of the thirteenth century. Of the other churches, that of St. Remigius is the most remarkable. In the south part of the town is the university building, which was formerly the palace of the Elector of Cologne. In 1777 Maximilian Frederick, elector of Cologne, established an academy in Bonn, which in 1784 was enlarged to a university. During the French occupation of the country the university was dissolved, and remained in abeyance till 18th October, 1818, when the King of Prussia re-established it on a more extensive scale, and assigned the electoral palace to its use. The University of Bonn is composed of five faculties—Protestant theology, Catholic theology, medicine, jurisprudence, and philosophy. Attached to it are a library of 200,000 volumes, a museum of antiquities, a collection of casts, a botanical garden, philosophical apparatus, geological collections, an observatory, and several institutions for facilitating the study of anatomy, surgery, and therapeutics. Albert, the Prince Consort, was a student here. Nothar was a professor at the university, and is buried in the cemetery outside the town. Among the other literary and scientific establishments are a gymnasium, a school of commerce, an academy of natural history, and a society for promoting the study of medicine and the natural history of the province.

Bonn is a sacred place in the eyes of musicians, for there the greatest tone-poet who has as yet blessed the world, the immortal Beethoven, was born 16th December, 1770, and there he learned the rudiments of his art. His father and also his grandfather were musicians in the court band of the Elector of Cologne at Bonn. His father was a tenor singer, his grandfather a bass, and also conductor of the band. BEETHOVEN was born in the house No. 515 in the Bergasse, marked by a tablet erected in 1870. He began to learn music at the age of four, at eleven was deputy organist at the electoral chapel, and at twelve pianist to the court band and conductor of rehearsals! The youth marked Lord Clive was twenty-two; and then a visit of Haydn, and a cordial word of praise from that great and good and generous man opened the eyes of the elector to Beethoven's true genius, and he sent him to Vienna to study music under the greatest masters, the elector bearing the charges of his education. Thus ended Beethoven's connection with Bonn, for he never returned again. Beethoven died in 1827; and in 1845 a bronze statue of him (an excellent likeness) was set up near the cemetery, greatly in consequence of the exertions of Schumann, who himself lies in the cemetery. The erection of this statue gave rise to the following epigram—

"While he lived he wanted bread,
When he died they gave him a stone."

For many years it was a puzzle for though the great master had been as shown by the common people in favour of Rossini in the last days, he was never really in want. He thought himself so, and a present of £100 was sent him at once by the Philharmonic Society of London; but at his death he left behind him a debt worth £1000, being a fund which he had collected for his graceless nephew.

The sketch-books of Beethoven during his Bonn time are crammed with ideas, but his early works, though many of them very beautiful (as the Bagatelle and the String Trios), are not so important in regard to his mature productions as are those of most other great musicians. They are sufficient, however, to throw lasting honour on Bonn and its little court orchestra.

Bonn (the *Bonna* or *Castra Bonnensis* of the Romans, frequently mentioned by Tacitus, and probably founded by Drusus) was one of the first Roman fortresses on the Rhine, and the headquarters of several legions. It was here that the Romans were defeated by the Batavians, 70 A.D. In the middle ages Bonn was a place of little importance until 1267, when the Archbishop of Cologne transferred his residence and seat of government hither. The German kings, Frederick of Austria (1314) and Charles IV. (1346), were crowned in the Münster.

In the Dutch War of Independence, in the Thirty Years' War, and especially in the Spanish War of Succession, Bonn suffered repeatedly from sieges. That of 1689 was conducted by the Elector Frederick III. of Brandenburg (King Frederick I.) at the head of the imperial and allied troops. Marlborough and other celebrated generals took part about the same time in the operations against the town. The walls were levelled in 1717, in accordance with the peace of Rastadt. In 1794 the French took possession of the town, but it was recovered by the Prussians in 1815.

BONNER, EDMUND, Bishop of London. He was born at Hanley, in Worcestershire. In the year 1512 he was admitted a student at Pembroke College, Oxford (then Broad Gate Hall), where in 1519 he took on two successive days the degrees of Bachelor of the Canon and Civil Laws, and he was ordained about the same time. In 1525 he was admitted to the degree of doctor, and had acquired a high reputation as a canonist, so that Cardinal Wolsey made him one of his chaplains, and master of his faculties and jurisdictions.

Soon afterwards we find Bonner chaplain to Henry VIII., incumbent of the livings of Blaydon and Cherry Burton in Yorkshire, of Ripple in Worcestershire, and of East Dereham in Norfolk, and a prebendary of St. Paul's. Much of this promotion was due to the favour of Cromwell, whose schemes for the reformation of religion Bonner promoted. In 1533 he was sent a second time to the pope to appeal to a general council against Clement's decree of excommunication against Henry VIII. on account of the divorce. In 1538 he was made bishop of Hereford whilst he was on an embassy to Paris, and before his consecration he was translated to London, and took his commission from the king in 1540. Thus far Bonner zealously promoted the reformation of the church, and the separation from Rome. But when death had removed Henry VIII., and the distinctly Protestant dogmatic Reformation began, under the advisers of Edward VI., and with the young king's warm sanction, Bonner's compliance ceased; he returned from the embassy to the Emperor Charles V. which he then filled, protested against Cranmer's injunctions and homilies, and refused to take the oath of supremacy. For these offences he was committed to the Fleet, from which, however, upon submission, he was soon afterwards released. He was subsequently committed to the Marshalsea, and deprived of his bishopric.

After the death of Edward VI. Bonner was restored by Queen Mary. Foxe enumerates 125 persons burned in his diocese for religion's sake; but this was not Bonner's crime. The guilt must be laid to the door of Philip of Spain and of Cardinal Pole, for it was they who turned Queen Mary from the course she at first adopted, according to the gentle advice of Gardiner and of Bonner, namely, a return to the state in which Henry VIII. had left the church. This might be described as a reformed Catholic church, and its revival necessitated abjuration of the Protestant "heresies" of the previous reign, but not any further return to Roman obedience. Bonner was a sincere man, humane and prudent; and the 125 executions in London cruelly laid to his charge by Foxe were carried out by him with such obvious reluctance as to bring down on his head a *censure for slowness* from the Privy Council. (See the learned and accurate "Reformation of the Church of England, its

History," &c., by Blunt; London, 1882.) It is fit here to remark, what Protestant England is only now realizing by the labours of such men as Mr. Blunt amongst contemporary documents, that the "Terror" under Catholic Mary cost fewer lives, both absolutely and proportionally, than the number sacrificed by her Protestant successor, the "good Queen Bess," in the cause of religion.

Upon the accession of Elizabeth Bonner was treated by the queen with marked disrespect; and in May, 1559, he was summoned before the Privy Council, and on his refusal to take the oath of supremacy when tendered, he was deprived a second time of his bishopric, and indicted for *præmunire*. He escaped the penalties attached to this charge, but he was confined for the rest of his life to the Marshalsea, where he died on the 5th September, 1569.

BON'NET, a name applied, in permanent fortification, to a work consisting of two faces forming with each other a salient angle, on the plan. It was employed to cover the angle of a *ravelin* when the faces only of the latter were protected by *tenaillons*. In those cases in which the parapet about the salient angle of any work, as a bastion or ravelin, is raised above the general level of the faces of the work, the elevated part is now called a bonnet.

BON'NET DE PRÊTRE was a term in field fortification applied by the French engineers to an indented line of parapet having three salient points, on account of some supposed resemblance to the object from which it was named. See REDAN.

BON'NET-PIECE, a Scottish gold coin of a very beautiful design, struck of native gold during the reign of James V., in the year 1539. It received its name from the fact of the king's head being represented as covered by a bonnet instead of a crown. Its weight is 72 grains, and the coins, from their beauty and rarity, are highly valued by antiquaries.

BON'NIVARD, FRANÇOIS DE, celebrated in the annals of Geneva for his labours and sufferings in the cause of liberty, and the subject of Byron's poem, "The Prisoner of Chillon," was born at Seyssel in 1496. He was educated at Turin, and in 1510 his uncle resigned to him the Priory of St. Victor, near Geneva. He took the side of the Genevese against the Duke of Savoy, and in 1519, on the entrance of the duke into Geneva, he was seized and imprisoned for two years in the castle of Grêlée. On his liberation he displayed a deep interest in the progress of the Reformation, and befriended the Protestant cause. In 1530, while on a journey, he was captured by a band of robbers, who delivered him up to the Duke of Savoy, by whom he was confined for six years in the castle of Chillon, and during the greater part of the time in a dungeon hewn out of the rock below the surface of the neighbouring lake. In 1536 he was liberated by the united forces of the Genevese and Bernese, and returned to Geneva, where he died in 1570. He was held in high honour by the citizens of that republic, and had a house assigned him and a pension. In compliance with the wish of the magistrates, he wrote a history of Geneva down to 1530, the MSS. of which is still preserved in that city.

BON'NY, a river which falls into the Bight of Biafra, and which is one of the numerous branches by which the Niger enters the sea. There is a dangerous bar at its mouth, but vessels drawing 18 feet of water can cross it at all times of tide.

Bonny is also the name of a town in an island at the mouth of the river Bonny. It is the chief town of a state which is tributary to the King of Benin. Bonny was formerly the greatest slave-market on the coast of Guinea. It is still a place of considerable commercial activity, being the centre of a great trade in palm-oil.

BONONCI'NI, GIOVAN NI BATTISTA (more properly *Buononcini*, the name having suffered a like change with *Buonaparte*), a musician celebrated more by his rivalry

with the immortal Handel than by his own merits, although these are considerable. Bononcini was born at Modena in 1672, and was instructed in music by his father, Giovanni Maria Bononcini, a competent artist in every way—as composer, as executant, and as theorist—chief musician to the Duke of Modena. Some confusion exists between G. B. Bononcini and his brother Antonio; the opera of "Camilla" being due to Antonio, who was a composer of greater repute amongst his contemporaries than was the subject of this article. The latter began producing operas at Vienna at the age of twenty, and in 1696, when twenty-four, he was in great favour at Berlin, where also was then living Handel, a lad of twelve. Bononcini became court composer at Berlin in 1703, and later on also resumed his old connections with Vienna. In 1720 he was invited to England to take part in establishing a society called the Royal Academy of Music, of which Handel had been just appointed director. Bononcini was received enthusiastically, both as a violoncello player and a composer, and as he was a man of real worth the factious mobility, still smarting under the new German monarchy (George I. remaining unable to speak English to the end of his day), took up his fame in opposition to that of the king's favourite, Handel. The Marlboroughs even received him into their home. Bononcini, nevertheless, was on so far friendly terms with Handel that he wrote an opera in conjunction with him and Ariosti, each taking an act. Ariosti came first, and as he was a man of small talent his act was completely eclipsed by that of Bononcini; but the latter, in turn, had the mortification to be pronounced by the irreversible verdict of the people to be further beneath Handel, who followed him, than he was superior to Ariosti. This was the occasion on which the famous epigram was produced, so often and so falsely attributed to Swift. The writer of it was John Byrom, a Lincolnshire author:—

"Some say, compar'd to Bononcini,
That Myndler Handel's but a ninny;
Others aver that he to Handel
Is scarcely fit to hold a candle.
Strange all this difference should be
'Twixt Tweedledum and Tweedledee."

The end of Bononcini's career was very curious. Handel quarrelled with Senesino, a favourite singer, and a large body of his partisans went over *en masse* to the Bononcini faction. Hardly, however, had the Italian gained this signal advantage than a change was made that a madrigal he had written for the Royal Academy some years before was no other than a transcript of one by Lotti. Bononcini was a very proud man, and declined to meet the charge; but so much proof was brought forward that he was forced, since he could not or would not deny the plagiarism, to leave the country. There seems great doubt about the truth of the charge; but there is not the least doubt that Bononcini could write better than Lotti, which renders the matter still more extraordinary. Further, the remarkable plagiarisms of Handel were allowed to pass unpunished. [See HANDL.] It is probable, therefore, that it was rather the haughtiness of Bononcini than his deed (if it was such) which so embittered the English against him. He afterwards played at the court of Louis XV., and is known to have composed the music to celebrate the peace of Aix la Chapelle in 1748, at Vienna; thence he went to Venice. The exact date of his death, which happened soon after 1750, is not recorded. Bononcini produced no less than twenty two operas, besides many symphonies, masses, and instrumental and vocal works. The only compositions of his actually in possession of the platform are his violoncello sonatas, some of which are still great favourites.

BON'PLAND, AIME, a celebrated traveller and naturalist, was born at La Rochelle, France, on the 22nd August, 1773. He studied medicine at Paris under Corvisart, at whose house he met Alexander von Humboldt,

whom he afterwards accompanied during his great scientific journey in the equinoctial regions of America. In this expedition, which lasted five years, Bonpland was intrusted with the botanical investigations, and he collected and dried more than 6000 specimens of hitherto unknown plants. On his return to France he handed over his collection to the Museum of Natural History at Paris, and received the appointment of director of the gardens at Navarre and Malmaison. In 1816 he went to Buenos Ayres, carrying with him a large collection of useful European plants and fruit-trees. He was well received by the government, and was appointed professor of natural history, but he held this office only for a short period. Five years later he started on another scientific expedition across the Pampas, the provinces of Santa-Fé, Gran Chaco, and Bolivia, to the foot of the Andes, which he wished to explore a second time. He was prevented from carrying out his design by Dr. Francia, the dictator of Paraguay, who caused him to be arrested in December, 1821, and who kept him a prisoner for nine years, during which he supported himself by his medical practice. In 1831 he was liberated, and took up his abode in the village of San Borja, in the south of Brazil, near the eastern bank of the Uruguay. In 1853 he removed to Santa Anna, in the Argentine province of Corrientes, devoting his attention to botany and horticulture until his death, which took place on the 4th of May, 1858. His principal works are the "*Plantes Equinoxiales Boreales au Mexique*," &c. (two vols., Paris, 1808-16), "*Monographie des Melastomées*" (Paris, two vols., 1809-16), and a "*Description des Plantes rares de Navarre*" (Paris, 1813-17).

BONUS. An extra return made to the shareholders of a company, in addition to the ordinary dividend. This mode of dividing profits is frequently adopted when the managers of a company wish to avoid the precedent of a large ordinary dividend. Thus if the ordinary return has been at the rate of 5 per cent. per annum, and owing to exceptionally favourable circumstances 7 per cent. has been earned during one year, the directors would declare a dividend at the rate of 5 per cent., and in addition a bonus of 2 per cent. In many cases, however, there is the *customary bonus*, as well as the ordinary dividend, and in insurance companies the former is an important item among the advantages held out to their customers.

BONY PIKE (*Esox lucius*) is the name given to a genus of fishes of the order GYMNURUS. The members of this family have an elongated body, covered in strong ganoid scales, a large sharp head, and arranged in oblique rows, overlapping one another, so as to form a complete bony armour. In the articulation of the vertebrae of the rigid column the bony ribs presents features absolutely unique among fishes, and approaching nearly to the structure of mammoths. The vertebrae are *opisthocentral*, each with a front and one behind. Instead of the first vertebra being united to the occipital bone by opposing cartilages with an elastic gelatinous fluid, as in ordinary fishes, this point is formed by a ball and socket, so that the head is rigid on movement. The head is prolonged into a cartilaginous hook-shaped element, composed of the jaw, premaxillary bones, and vomer. Both jaws and the palatine are armed with bands of rasp-like teeth, and rows of fine conical teeth. All the fins are protected on their posterior edge by two rows of spinous scales, and are supported by bony rays only. The dorsal and anal fins are placed far back, just before the tail fin. The tail fin is *heterocercal*, that is, the tapering extremity of the spinal column is prolonged through the upper lobe of the tail fin. The cloacal organ is situated at the tip of the upper jaw, central to the anterior nasal folds arranged simply. The gills, on four sides, have a perfect bifoliate structure, and behind the last arch there is the ordinary fissure; a respiratory gill lines the operculum, and a

pseudo-branchia is also present. The branchiostegous membrane passes without division evenly across the throat, and is sustained on each side by three branchiostegals. The swim bladder is divided into cells, the partitions being provided with muscles; and the pneumatic opening is a long slit in the upper wall of the throat. The stomach has no caecal expansion; there are several pancreatic caeca; and there is no spiral valve in the large intestine. These fishes attain a length of 6 feet, and inhabit the rivers and lakes of the United States and Canada, Mexico, and Cuba. They feed on other fishes, and almost rival the common pike in voracity.

These fishes have been found fossil in deposits of the Tertiary period, both in Europe and North America.

BONZE is the name by which the priests of Buddha are usually designated in Japan. They are under a vow of celibacy, and form a large corporation of male and female ecclesiastics. This priesthood comprises individuals of all ranks of society. Persons of high birth are known to have entered the order of Bonzes, but the majority belong to the lower and poorer classes. The principal moral precepts which they inculcate are five, viz. not to kill, not to steal, to observe chastity, veracity, and abstinence from spirituous liquors. There are convents both for male and female Bonzes, some of which have their own fixed annual revenues, while others are maintained by voluntary contributions from the people. By the Portuguese the name is extended also to the priests of China, especially to the Buddhists.

BOO BOOK OWL (*Athene boobook*) is a small species of OWLS, exceedingly common all along the southern coast of Australia. It is about 10 or 11 inches long, with the plumage of the upper surface and wings reddish brown, spotted in some places with white, and that of the lower surface nearly white, reddish on the throat, and streaked with reddish brown. It flies in pursuit of prey both by day and night; but its peculiar cry of *bock-bock*, from which its native name is derived, is only heard during the period of twilight and darkness. The note is said to bear some resemblance to that of the European cuckoo, and hence the colonists, imagining that everything goes on by the rule of contrasts at their end of the globe, determined that it was the cuckoo, which, in accordance with the law above mentioned, uttered his notes at night instead of during the day. The food of this owl consists of small birds and large insects. It breeds in the holes of large old gum-trees, laying its eggs upon the rotten wood occupying the bottom of the cavity.

BOOBY (*Sula fusca*) belongs to the PELICAN family of the order ANSERES. These birds derive their name from their apathy in allowing themselves to be captured or knocked on the head without any attempt to escape, whence their stupidity has become proverbial. Thousands breed on the Island of Ascension, on the Bahamas, on the islets off the coasts of Guinea, along the shores of New Spain and the Canaries, as well as of Brazil. They are found also on the Island of Rodriguez, the Alacranes, &c. Mr. Gould describes one from the Tasmanian seas, under the title of *Sula australis*. "Like other members of the family," he says, "this species will allow of its being taken by the hand. Some of my specimens were so taken on a rock on the Aetern Islands." Boobies often alight on the rigging or yards of vessels, and rest unconcernedly, permitting the sailors to lay hold of them. Dampier says that on the Alacran Islands, in the Gulf of Mexico, the crowds of these birds were so great that he could not pass their haunts without being incommoded by their pecking. They were ranged in pairs, and though he succeeded in making some fly away by the blows he bestowed upon them, the greater number remained in spite of his efforts to make them take wing.

Numerous voyagers have described or alluded to the persecution which the booby experiences from the frigate

or man-of-war bird (*Tachypetes aquila*). Nuttall says, "The boobies have a domestic enemy more steady, though less sanguinary, in his persecutions than man; this is the frigate pelican, or man-of-war bird, who, with a keen eye, descrying his humble vassal at a distance, pursues him without intermission, and obliges him by blows with his wings and bill to surrender his finny prey, which the pirate instantly seizes and swallows. The booby utters a loud cry, something in sound betwixt that of the raven and goose; and this wailing is heard more particularly when pursued by the frigate bird, or when the assemblage happens to be seized with any sudden panic." Leguat thus writes:—"The boobies come to repose at night upon the Island Rodriguez, and the frigates, which are large birds, so called from their lightness and speed in sailing through the air, wait for the boobies every evening on the tops of the trees. They rise on the approach of the latter very



The Booby (*Sula leucogaster*).

high in the air, and dash down upon them like a falcon on his prey. The booby, struck in this manner by the frigate, gives up his fish, which the frigate catches in the air. The booby often shrieks, and shows his unwillingness to abandon his prey; but the frigate mocks at his cries, and rising, dashes down upon him anew, till he is compelled the booby to obey." The boobies are generous in their habits, vast numbers congregating together and colonizing a common breeding-place. The bill is strong, conical, and longer than the head. These birds are about 30 inches in length. The colour of this species is blackish brown or ashy brown above, and whitish beneath; the primaries are black, the naked skin of the face reddish, the orbits and base of the bill yellow, the legs straw colour. The young birds are spotted with white and brown. Though well furnished with oars the booby seldom swims, and never dives. Its mode of taking its prey is by dashing down from on high with unerring aim upon those fishes which frequent the surface, and instantly rising again into the air. Their legs are strong and robust, and their wings very long. They walk with difficulty; and when at rest on the land their attitude is nearly vertical, and they lean on the stiff feathers of the tail, like the cormorants, as a third point of support. The ledges of rocks or cliffs covered with herbage are the places generally selected for the nest, which is formed of twigs matted together with sea-weed, and only one egg or one young bird is found in it at a time.

BOODROOM, BOUDROOM, or BODRUN, a seaport town in the pashalik of Anatolia, Turkey, situated on the N. shore of the Gulf of Reg. It is a poor town now, but stands on the site of the ancient *Halicarnassus*, the birth-place of Herodotus and Diogenes. Above the town are the remains of a theatre, 280 feet in diameter, and which seems

to have had thirty-six rows of marble seats. Old walls, exquisite sculptures, fragments of columns, and other relics, evincing its ancient splendour and importance, abound in the town and its vicinity. It was the residence of the ancient kings of Caria, and it was here that Artemisia, queen of Caria, built the splendid tomb for her husband Mausolus, which was one of the wonders of the ancient world, and originated the name *mausoleum*, as applied to magnificent sepulchres. The castle or fortress, situated on a projecting rock on the E. side of the harbour, was built by the Knights of Rhodes in 1402.

BOOK. The name given to any distinct literary production in one or more volumes, and sometimes also to a division or group of chapters forming part of a single work. The word is most probably derived from the same root as beech (Anglo-Saxon *boe*, Ger. *buch*, Ital. *biglia*, Dutch *boek*), the bark of this tree and thin boards of the wood having been anciently used for writing on in most of the northern countries of Europe. The Greek names *lyblos* or *biblion* are derived from the Egyptian papyrus, and the Latin name *liber* from the same source, the former having reference to the plant itself, under its Greek name *lyblos*, and the latter to the cellular tissue inclosing the stalk. (*Papyrus*, the Greek form of the Egyptian name of the plant, gives us our "paper.") The practice of writing upon wood dates from a very remote period, and is referred to in the Pentateuch (Num. xvii.) and also in the prophetic writings (Ezek. xxxvii.) of the Old Testament.

Perhaps the earliest method of preserving inscriptions was by means of engraving upon rocks or prepared tablets of stone. Plates of metal were afterwards used for the same purpose, as were also flat pieces of wood, leaves, and the bark of trees; and then at a later period the prepared skins of animals, parchment, and the paper made from the papyrus, or paper reed of Egypt. Great skill was displayed in the preparation of the latter material for writing purposes. The outer concentric layers of the stalk were first separated into thin sheets by means of a needle, and such pieces were sometimes obtained with a breadth of from 10 to 15 inches. They were then laid out side by side on a smooth, flat surface covered with a thin paste of wheaten flour, and the edges being first placed so as to unite, the whole was dried in the sun, and the sheets thus obtained were afterwards coated with a preparation that gave them an even surface and made them pliant and flexible. They were finally rubbed down with hand rollers, or beaten all over with hammers, and were then ready for use. By joining the sheets thus formed, rolls of any length could be obtained, and frequently twenty or more were employed for a single book. The ancient Jews appear to have been familiar with all the materials mentioned for the preparation of books, but to have used most frequently prepared skins or parchment. These were made of various lengths, and generally from 12 to 14 inches in width. They were attached at each end to rollers, and were rolled together until they met midway. These rolls were sometimes secured with a seal, and occasionally several were rolled up together and secured in this way. Pens of reed were employed for writing, and such pens are still in common use throughout the East. The ink was made from lamp black, burnt ivory, charcoal, saffron, &c., the particles being crated fine and suspended in gum water. Among the Greeks and Romans books were also written upon similar materials, but tablets of metal, ivory, or wood were also frequently employed. The works of Hesiod, written upon plates of lead, were preserved in the Temple of the Muses in Boeotia; and the laws of Solon were written upon wooden boards. Usually, when wood was employed, the surface was coated with wax, a margin being provided to prevent erasure by friction. The writer then scratched upon the wax with a metal stylus, one edge of which was pointed for writing, and the other flattened for

erasure. Such tablets were sometimes joined together by means of rings at the back, the collection bearing a rude resemblance to the modern book, as in the large collection of banker's receipts found in the house of Juncus at Pompeii. In the first centuries of the Christian era books were written in the form of rolls, and also upon squared leaves—the same name being applied to both. The oldest Greek MSS. in existence, viz. those discovered at Herculaneum, are in the form of papyrus rolls, but others dating from the fourth and fifth century are written upon sheets. During the middle ages the roll went out of fashion, and books were made of leaves sewn together at the back, and a binding of metal, wood, or leather was employed for their preservation. The rolls had usually been preserved by cylindrical covers of parchment, or similar boxes of cedar-wood, fitted with covers. The sheets of papyrus appear to have gone out of use during the seventh century, and their place was taken by parchment, which continued to be the favourite material for many centuries, though paper made from cotton came into use about the beginning of the tenth century, and linen paper during the thirteenth. The principal authors and transcribers were to be found among the monks, especially those of the Benedictine order, to whose patient labour we owe the preservation of many of the most valued of the works of antiquity. These displayed great care in making their copies, and the books thus prepared were frequently beautifully illuminated in gold and colours, and magnificently bound. There are some very splendid specimens now preserved in the British Museum of these illuminated books. At a later period—previous to the introduction of printing—the copying of books was undertaken by laymen, and in the large cities and universities books were lent out to students and others who were too poor to purchase them, something after the method adopted in the modern circulating library. With the introduction of printing, however, an enormous impetus was given to the production of books. At first their publication was hindered or hampered by strict systems of licensing and censorship, but these were gradually removed, and the issue of books increased rapidly—their number of readers ever growing larger and larger until the present time.

The enormous influence of books on mankind, as a means of multiplying wise speech, has been by no man more clearly set forth than by Thomas Carlyle, and in no passage more fully by him than in the following from "Sartor Resartus" (Book II. 85):—"We dream indeed is the virtue of a true book! Not like a dead city of stones, yearly crumbling, yearly needing repair; mere like a tilled field, but like a spiritual field, like a spiritual town, let me rather say, it stands from year to year and from age to age (we have books already that number some 150 human ages), and yearly comes its new produce of leaves (Commentaries; Definitions; Philosophical, Political Systems; or were it only Sermons, Pamphlets, Journalistic Essays, every one of which is a talismanic and thaumaturgic, for it can persuade men). O thou who art able to write a book, which once in the future centuries often there is a man gifted to do, envy not him when they name City-builder, and inexpressibly pity him when they name Computer or City-burner!"

BOOK-BINDING is the art of connecting together, in a firm and durable manner, and protecting with suitable covers, the several sheets of which a volume is composed; including also the preliminary operations of folding each sheet so that the several pages of which it consists may follow one another in due order, and of *gathering* or collecting together in proper sequence the several sheets, and *collating* or examining them, to see that no error has been made in the arrangement. To all these operations certain letters or figures, called *signatures*, are placed at the bottom of the first page and one or two other pages of each sheet.

In the subsequent processes it is necessary to distinguish

between the comparatively slight and loose mode of binding in cloth or paper covers, which is technically called *casing*, and the more solid kind of binding in leather, to which, among the trade, the application of the term *binding* is limited.

If the book is to be simply cased, the sewing of the sheets, individually, to a series of strings called *bands*, stretched in a machine called a *sewing-press*, is the next operation; but if it is to be bound, the sheets are previously passed in small parcels through a *rolling-press*, to make them close and smooth. The bands run across the back of the book, and are often rendered invisible by cutting with a saw, in the back of the collected parcel of sheets, a series of grooves to receive them. After the sheets are thus sewn to the bands, and also connected together here and there by a *catch-stitch*, the bands are cut so as to leave about an inch projecting beyond the book on each side, and the back is smeared over with melted glue, which further unites the back edges of the several sheets. The back is then rounded in a curious manner by a process of hammering, before the glue is fully set; and the book is compressed firmly between two boards, with the back projecting a little, while the back is further beaten so as to make it spread out a little over the edges of the boards. If for binding, the edges of the sheets are then *ploughed* or cut with a machine to a perfectly flat and smooth surface, the convexity of the back being temporarily destroyed while the front edges are cut, so that they may be cut flat, and afterwards restored, in order to draw them into a corresponding concavity.

The *boards*, or pieces of millboard (which is a kind of strong and smooth brown pasteboard, of different degrees of thickness to suit the different sizes of books), which constitute what in ordinary language are the covers of the volume, are cut a little larger than the leaves, and when the volume is to be bound are laid on the sides of the book, with their back edges against the projecting or overlapping edges of the glued back, and secured to the book by passing the ends of the strings or bands, which are previously scraped thin, through holes near their back edges, from the outside, and gluing them down firmly and smoothly on the inside. In binding, the leather is put on after the boards are attached to the book, in the manner above described. Books are generally so bound as to leave the back of the cover detached from the glued back of the book itself, which is done by interposing a double layer of paper or cloth between the back and the cover, gluing one layer to the cloth or leather cover, and the other to the back, and connecting the two layers with one another at their edges only.

Half-binding is that style of binding in which only the back and corners are covered with leather, and the sides with paper or cloth.

In the *finishing* or ornamenting of a bound book much taste may be displayed. The cut edges of the leaves are usually either sprinkled with colour, smeared over uniformly with a sponge dipped in colour, marbled, or gilt with leaf-gold; the edges being, for the last-mentioned process, previously coloured with red chalk and water, and then moistened with white of egg mixed with water, and subsequently burnished with a smooth hard stone, which polishes, but does not disturb the gold. The covers or boards are sometimes coloured by the binder, and are impressed, both at the sides and back, with ornamental devices and inscriptions, by the application of heated stamps or dies, either with or without leaf-gold; such impressed devices as are not gilt being distinguished by the name of *blind-tooling*. When gold is used, the surface of the leather is prepared to receive it by the successive application of white of egg and a little oil. In ordinary hand-work the patterns are produced by the separate application of a number of small dies, and engraved rollers for lines and long narrow patterns; but very often a number of dies are fitted

together and applied simultaneously by means of a press. This process is called *blocking*.

Much ingenuity and taste have been devoted of late years to the perfection of cloth-binding or casing, and by peculiarities in the mode of weaving the cotton cloth used for the purpose, and of subsequently stamping or embossing it between steel rollers, the textile appearance is destroyed, and a surface is sometimes produced very nearly resembling morocco leather. The process of cloth binding differs from leather binding in this, that the case or cover of the book is completely finished before it is attached to the volume at all. It is made by covering the boards, previously cut to the proper size, and sometimes ornamented by bevelling or cutting away the edges, with the prepared cloth, leaving a space between them sufficient for the back of the book. When the glue used for this purpose is quite dry, the case is ornamented by blocking a pattern on the side and back. This is sometimes called "blind tooling," or merely the impression of the block upon the cloth; sometimes it is coloured by a second application of the block charged with a stiff ink prepared for this purpose, and sometimes gold-leaf is used to produce gilt tooling. Very commonly a combination of two or more of these processes is employed on the same book, and sometimes pieces of cloth of a different colour are cut to the required shape with a die and attached to the board before blocking. The blocking press, as now made, is rather an elaborate piece of mechanism. It has arrangements for preserving the "register," by which several successive impressions can be struck on any required part of the board, and for heating the die or tool, as well as for inking it when necessary. It is generally driven by steam power, as the demand for cloth binding greatly exceeds that for leather, and necessitates machinery adapted to turn out large numbers rapidly. The gold-leaf is applied very much in the same way as for leather binding. The heated die softens the size with which the cloth is covered, and causes the gold to adhere. The superfluous gold-leaf is then rubbed off, and the black tooling, if any, applied. When the case is quite finished it is glued to the volume, which has been previously sewed, cut, and gilt-edged if necessary. The back of the book is not usually attached to the case directly, but is covered with a lining of paper and muslin, which, along with the ends of the boards, is attached to the boards with glue.

The peculiarity of *india-rubber binding* (which has been imitated with an artificial cement) consists in the entire absence of sewing. The back as well as the other edges are ploughed, so as to reduce the book to a collection of single leaves, to the back edges of which a layer of caoutchouc or cement is applied. This mode of binding is well adapted for maps, music, ledgers, and manuscript books generally, as it allows the book to lie open with equal facility at any place, and the inner margin to be used, if needful, close to the edge of the paper; but books so bound are not so strong and durable as when stitched. Recently machines have been introduced which fasten the leaves with pieces of bent wire, termed "staples," instead of stitching them, and a great many cheap books are now stitched in this way. The ordinary sewing machine has also been utilized for certain kinds of work.

BOOK-KEEPING. In every commercial transaction the principle of barter or exchange is involved. Value, or what is taken by common consent to represent value, is transferred from the possession of one person to that of another, and the constant repetition of such exchanges constitutes commerce. From the necessity for keeping a permanent record of these transactions the art of book-keeping has arisen. In its simplest form this record would be merely a rough note of quantities, and of the names of the merchants or dealers. Thus in ancient times a corn-dealer would chalk upon his vessel the number of measures taken out, and on his door the amounts delivered, under a

different mark for each buyer. But a more systematic and complete arrangement became necessary as soon as business transactions increased in number. It was impossible for men engaged in rapid and complex negotiations to retain in their memories the details of each of their numerous sales and contracts. A lasting record must be kept that should be intelligible to both parties. It was also impossible for any trader to be continually examining his accounts to ascertain his profit or loss on each transaction. The accounts, therefore, must be collected in such a way that at settled times it might be exactly ascertained how far the business was profitable or otherwise as a whole. The first object has been attained by the arrangement of accounts which is now universally used. The trader keeps apart duplicate sets of money and date columns to every customer. At the top of the account is placed the name of the person; beneath on the left-hand side are, first, lines ruled to inclose the dates of the items, then a blank space to contain particulars of the items, and finally money columns for the values. This side is devoted to the collection of debts owing from the customer to the trader, and is headed *Dr.*, meaning that the former is debtor to the latter. The right-hand side is ruled in the same way, but is headed *Cr.*, being reserved for amounts paid by the customer or for debts owing by the trader to him. Hence before every item on the debit side is placed *To*, and on the credit side *By*. This arrangement is the basis of the ruling of every account-book, though other columns are often added for folio numbers to facilitate reference from one account-book to another. The knowledge of the profit or loss on the accounts as a whole is gained by collecting all the accounts, or summaries of them, into one book, finding the differences or balances of each, and drawing up an account-sheet, placing the amounts on the right or left-hand, as they may be debits or credits. The difference of the totals will then show the profit or loss, if allowance be made for capital, loans, or any other amounts not strictly arising from the transactions of the trade. The book in which all the accounts are collected is called the *ledger*, and should contain a complete list of any business. In practice, as a matter of convenience, various books are appropriated to different kinds of transactions, and into these summaries more or less full are entered into the ledger. Nearly every trader uses a day or bought and sold book, a cash book, and a book for particulars of bills payable and receivable. Other books, such as warehouse-book, insurance-book, &c., vary according to the nature of different trades.

Single Entry.—To the method of book-keeping on the basis of the bare principles just described, the term "single entry" is applied. All accounts from the various sources are collected into the ledger, the balances extracted and entered on an account-sheet. The amounts on the debit side are entitled *assets*, and those on the credit side *liabilities*. As the correctness of the result entirely depends on the absence of any errors in transferring entries, and the unflinching extraction of every balance, the system when applied to the accounts of extensive businesses is open to very grave objections. As regards debts owing to customers a certain check is provided by the accounts that are sure to be rendered by them, but as regards assets the case is obviously different. The mere accidental admission of two prices may cause the loss of large sums. The ease with which the accounts may be falsified by a skilful book-keeper offers most serious temptations to fraud. Hence also no means provided of analyzing the profits, so as to form a judgment of the profitability of different departments. This can only be done by the tedious process of going through each account separately. This would be a very uncertain and difficult operation after any lapse of time for the trader himself, and it would be well-nigh impossible for an outsider to reach a satisfactory conclusion.

For small businesses, however, the system may sometimes answer sufficiently well. In such cases the profits may often not be large enough to pay the cost of a more certain method.

Double Entry.—In consequence of the defects inherent in "single entry," a system called "double entry" has accordingly come into general use. Its vital principle is that every item should appear twice in the ledger under different headings. Accounts are opened here under names derived from different classes of transactions, under one or other of which every item can be placed. Thus an account for *cash* might be opened to receive all cash items; an account for *charges* to include all items that customarily involve profit, but on which there is often expenditure; for *stock* to include items of goods bought or sold. All entries are prepared for the ledger in a book called the *journal*, which is balanced monthly. In the books whence the items are drawn for entry into the journal each item stands to the debit or credit of some account. Now the existence of a debtor implies that of a creditor also, and the same is true of the reverse statement. It then, wherever there is a debtor, one of the accounts opened under the name of a class of business be taken as a supposed creditor, and *vice versa*; a second series of entries may be made, in which the amounts and particulars will correspond, but in which the items will appear on the debit side where before they were on the credit side, and on the credit side where before they were on the debit side. When this has been done all the debit accounts are collected together and all the credits placed together; then it is clear that the totals of each will be equal. This is what is carried out in the journal, the debits being placed first, and then the credits. The balancing is generally done once a month, after which the various amounts are posted to their proper accounts in the ledger. The entries for the journal are frequently perfect in a rough book of some sort, and all each transaction is merely entered from a cash book, which is so kept as to agree with the banker's pass-book. At the time for closing the books all accounts are cast up in the ledger, the balances extracted and placed on the proper side of an *account sheet*. The totals of each must then agree, since every entry has been taken from the journal. It is called the *trial balance-sheet*. From the amounts shown on the *account sheet* the system of expense of the various parts of the business can be seen at once. The *account sheet* is now posted through the journal to the debit and credit side of the balance of which is then carried to the accounts of the partner or partners. A final *balance-sheet* is then drawn up, on "single entry." With such a system many false entries are avoided, and so much so, in fact, that from generally taking the term of representing all debits and credits as *assets* and *liabilities*, or of estimating the value of stock.

Mixed Method.—There is another system sometimes used, known as the "mixed method," in which, while the principle of double entry is retained, no journal is employed. The chief points always to be kept in view in this method are, first, that the ledger should present a complete picture of the business, often not only to the trader himself, but to others; if occasion should arise; secondly, that every entry should be by folio numbers from one set of books to another; and thirdly, that entries should be so placed as to be easily understood, not to mislead, to be clear. In fact, on the whole, of pounds, shillings, and pence, all is much to the idea and difficulties of book-keeping. A double entry is not only easier to add up, and in consequence less apt to be done, but also takes up less time, as only two entries are required for money.

Book-keeping, as we have reported, only dates from the year 1494, when a famous Italian, Luca, wrote a work on the subject which was published at Venice. Some method, however, was undoubtedly known to the Latins,

for Pliny mentions the subject in his second book (chapter seven), and Cicero was able to supply his son with money while the latter was at Athens by means of letters. In fact, it seems almost impossible to imagine any extensive trade without a record of it being kept in writing.

BOOM, in a ship, is the name given to those poles or yards which jut out from a support for the attachment of the lower edge of a sail. They take their name from the sail that is attached to them, as jib-boom, main-boom, spanker-boom, &c. A boom in a harbour means a strong chain stretched across a channel to prevent the entrance of a hostile vessel. Such chains are floated by means of logs of wood, and are firmly moored at each end. In modern warfare they are also used to protect ironclads from the attacks of torpedo boats during the night, or when the ships are at anchor. Such defences were successfully used under the direction of Hobart Pasha for the protection of his fleet during the war between Russia and Turkey in 1877-78. The name boom is also given to the upper and lower flanges of the girders employed in the construction of iron bridges.

Another use of the term has been adopted in America, and a sudden strong rise in values is termed a "boom." Thus stock exchange speculators speak of a "boom" in railways, or a "boom" in land, &c.

BOOMERANG, a peculiar missile used in hunting and war by the aborigines of Australia. It consists of a piece of hard wood varying in length from 2 feet to 2 feet 8 inches, 2½ inches broad, and ½ inch thick. It is parabolic in shape, and has rounded ends, one side being flat and the other convex. The inner side is brought to a blunt edge. When used it is held in the hand by one end, the convex side downwards, and is thrown in the *opposite* direction to the object aimed at. It ascends in the air with a gyratory motion and a whirring sound, and at length comes to a stop, and then swiftly returns, falling behind the thrower. Few, if any, Europeans have managed to acquire the art of throwing it, but the native Australians are very skilful in its use. That it is a weapon of very early antiquity is proved by the discoveries of Sir H. Layard at Nimrod, where he found a representation of the Assyrian Hercules or the "mighty hunter" Nimrod, who holds one of these weapons in his right hand. A similar weapon is used by the Indians of Arizona and New Mexico, but this does not return to the thrower.

BOORT or BORT is the name under which **DIAMONDS** unfit for working as gems are sold. It includes the small fragments split off larger stones when reducing them to shape, the *carbundo* or blackish diamonds of Brazil, and those diamonds with an imperfect cleavage and interlaced structure that are useless as gems. In powder it is used on soft iron plates by lapidaries for cutting and polishing diamonds and hard stones; small drills are also made with fragments of it; and of late years it has been used in the diamond-rock drill, where, in a crown or ring of soft iron, fragments of bort are fixed on both the outer and inner edge; by the rapid rotation of this a corresponding ring of the rock is abraded and carried off in suspension in water, leaving a central cone of solid rock, which may be subsequently extracted.

BOOT or BOOT'IKIN, an instrument of judicial torture formerly used in Scotland as a means of extorting confessions or evidence. It was originally brought from Russia, and consisted of a narrow wooden box made by nailing four planks together, and the leg of the prisoner being placed in it, wedges were inserted between the calf of the leg and the sides of the box, and struck home with a mallet. Sometimes a case of iron was used in a similar way, and occasionally the wedges were placed against the shin bone. The torture, which was of the most horrible character, was sometimes administered until the limbs were wholly crushed and rendered for ever useless. In the

judicial records of Scotland there are many instances given of the application of the boot, and some of the details are of the most revolting character. It was last used in 1690, when an English gentleman named Neville Payne was, by the express command of William III., submitted to the torture of the thumb-screw and boot, and which in his case were applied with fearful severity. It is believed that all judicial torture had been given up in England about fifty years previous to this, and it was finally abolished by 7 Anne, c. 20.

BOOTAN' or BHOOTAN. See BHUTAN.

BOOTES (from the Greek *bous*, *bos*, an ox), one of the old constellations. Its name signifies "the herdsman," but it was as frequently called *Arctophylax* by the ancients, which means the "guard of the bear." It would seem to be probable that the Great Bear was originally either a team of oxen or a waggon, and Bootes the driver. Another name for it was *Arcturus*, but this is now limited to its principal star. [See ARCTOS, ARCTURUS.] The constellation will be found in the Plate CONSTELLATIONS, in the Northern Hemisphere, just above the figure XIV. It is there figured as a huntsman, with reference to the myth of CALLISTO.

BOOTH, the name given to a stall or tent erected at a fair, and also to any house or shed of a temporary character built by boards, boughs, canvas, &c. In former times, when the general trade was carried on by means of periodic fairs, it was customary for the traders to erect temporary structures to contain their goods while the fair lasted. When a fair occurred at short intervals these erections were frequently left standing, and were gradually composed of stronger and more durable materials. In this way rows of houses and shops sprang up, first consisting merely of a shop on the ground floor, with a cellar beneath and a "solar" or chamber above, but afterwards assuming larger dimensions. Instances of this may be found in London, where, according to Stow, Old Fish Street arose in this fashion, and also part of Cheapside from "the Great Conduit west;" and in Edinburgh, where "the Luckenbooths" arose in the centre of the High Street. At the present day booths must be licensed, and all unlicensed booths may be suppressed as public nuisances, and their owners fined. An exception is allowed in the case of the temporary erections put up at fairs, festivals, village feasts, &c., by itinerant actors and showmen, where they are permitted by the justices of the peace or other local authorities.

BOOTH, BARTON, an eminent actor, whose family was connected with that of the Earl of Warrington, was born in 1681, and educated at Westminster by the famous Dr. Busby. He ran away from Trinity College, Cambridge, and joined a company of strolling players. He speedily returned to his home in great distress, but his ruling passion could not be restrained. He at length chose the stage as a profession, and first obtained his great reputation in Dublin.

In 1701 Booth appeared at the Theatre Royal, Drury Lane, in the character of Maximus in Lord Rochester's "Valentinian." His reception was enthusiastic, and he shortly established himself in public favour as second only to his great friend and instructor Betterton. In 1712, in the production of Addison's "Cato," Booth performed the principal character, and was complimented by Bolingbroke, who presented him with fifty guineas "as a slight acknowledgment of his honest opposition to a perpetual dictator, and his dying so bravely in the cause of liberty." The tragedy was warmly cheered by Addison's party, the Whigs, and Bolingbroke thus took away the sting of the party success by his witty allusion to the public fear as to the ambition of the great Whig general, Marlborough—far not at all ill-founded.

Booth's masterpiece as an actor is said by Cibber to have been Othello, but his favourite part was the far less

important one of the ghost in "Hamlet"—a performance (says Macklin) which has never been imitated successfully. He died in 1733, and his widow some years after erected a monument to his memory in Westminster Abbey.

BOOTHIA FELIX, a peninsula of British North America, joined to the mainland by an isthmus, and separated from North Somerset Island by Bellot Strait. It was discovered by Captain (afterwards Sir James) Ross in 1830, and was named after Sir Felix Booth, then sheriff of London, who had fitted out the expedition. The north magnetic pole was here first distinctly localized by Captain Ross. The Gulf of Boothia separates Boothia Felix on the west from Cockburn Land on the east.

BOOTLE, a rising municipal borough in Lancashire, 3 miles north of Liverpool. It is a seaport at the mouth of the Mersey. The Church of St. John is a fine cruciform building of New Red Sandstone. There are three other churches, and chapels for most denominations of dissenters and Roman Catholics. The Molyneux Assembly Rooms, erected in 1870, are used for entertainments, &c.; the offices of the corporation are on the ground floor. The borough hospital, erected in 1872, is a handsome building, with accommodation for twenty-six patients. The town supplies Liverpool with a considerable quantity of water, obtained from springs. The water-works belong to the corporation of Liverpool. Bootle was incorporated in 1868, and is governed by a mayor, six aldermen, and eighteen councillors. The whole of the property in the town belongs to the Earl of Derby, and the three wards into which it is divided are named Derby, St. John, and Knowsley. The population in 1881 was 13,115, as compared with 8,160 in 1841.

BOOTON, an island lying off the S.E. extremity of the island of Cebu, in the pentagon S. lat. 12° 3' N. It is nearly in the centre of the island. Booton is about 8 miles long from N. to S., and its average breadth is about 20 miles. It is separated from the island of Panay by a narrow and navigable strait, called the Strait of Booton. The island is mountainous and woody, but is well cultivated in pines, yielding rice, maize, yams, and cloves, and the usual variety of tropical fruits. Poultry and goats are reared for food, and bullocks are numerous. The chief town is called Kalis-Sansong; it is the seat of the sultan of the island, whose power not only extends also over the chiefs of the islands of Pangasinan and Cebu.

BOOTS, the outer coverings for the feet, the leather, cloth, or other material of which they are made being continued so as to cover the leg or part of it. The word is derived from the German *bütte*, whence also the French *botte* and the Italian *botta*, a "bottle or bottle," which, after being applied to other uses of leather or other material for foot gear also. Boots, as an article of dress were unknown among the ancient Jews, they were, however, ordinarily used in protecting the feet. This consisted merely of a sole of leather, felt, cloth, or wood attached to the foot by thongs. The ancient Egyptians also wore sandals, and they employed palm-leaf sandals and wooden stalks for their manufacture in addition to the materials mentioned. The Assyrians employed wood in the soles for their sandals, but from the pictures of their monuments it would appear that they covered only the heel and sides of the foot, leaving the toes and the whole of the upper part bare. Foot coverings, extending to a certain height up the leg, were in use among the ancient Greeks and Romans; but the sandal or low shoe still prevails most extensively throughout the East. In England boots appear to have been gradually introduced after the Norman conquest, and long boots formed part of the dress of every gentleman at the time of Edward IV. Among the dandies of the period the boot was a very important article of dress for the exhibition of extravagance. Made with long pointed toes, these were sometimes covered forwards, and extended to such a length that they were fastened with ornamental clasps to the garter of the

wearer. To curb such displays the law intervened, and limited the length to which the toes of boots might be extended; and the men of fashion, not to be conquered, took to wearing boots made of such breadth at the toes that the law again interposed, restricting expansion in that direction also. About the time of the Reformation very high boots, with a loose flap at the top, were worn; and in the reign of Charles I. a boot of Spanish leather, with a very wide top, was worn by the Cavaliers. A similarly shaped boot, but with the upper edge adorned with lace, was worn by the courtiers of Charles II. During the reign of William III. the jack-boot was introduced, and was generally worn by cavalry soldiers and horsemen. This extended above the knee, with a flapping top; it had a high heel, and bore a large spur. In a modified form, and called a top-boot, it was regularly worn in England until recent times, and is still used by jockeys and horsemen. The John Bull of caricature is always represented with top-boots, such foot coverings during the eighteenth century being regarded as peculiarly the mark of an Englishman. The Hessian boot, which was introduced during the reign of George II., was worn outside the tight pantaloons of the period, and the Wellington boot was introduced into the army by the great duke to supersede the Hessian. In England it was always worn under the trousers, but in the United States these garments were pushed in at the top. At the present time there is great variety in the shape of boots, and in the materials of which they are made. By far the largest number are shaped simply to cover as far as the ankle, laces, buttons, and elastic webs inserted in the sides being used to fasten them to the feet. Formerly boots were made wholly by hand, but numerous machines to prepare and sew the leather have been introduced.

BOOTY. The military name given to property taken from an enemy during war. By law it belongs to the sovereign, who may either appropriate it or order it to be given back to the enemy, but when it is not restored it is always given to the army that captured it. Its distribution is arranged as follows:—Two agents are appointed by the officers, one by the field officers and one by those of lower rank, to whom is intrusted the collection and sale of the property. The commanding officer sends in a list to headquarters of those who are entitled to share, and after an interval the money is paid according to the scale provided by the military regulations. In the navy such property is termed a prize, and the proceeds prize-money. The collection and distribution of such moneys extends over an incredibly long period, and the regulations as to its distribution do not give universal satisfaction.

BOPP, FRANCIS, an illustrious German scholar and philologist, was born at Mainz on the Rhine, 14th September, 1791. He was educated at the Lyceum of Aschaffenburg, in Bavaria, whither his parents had removed, and at an early age became imbued with an inclination towards the study of the Eastern languages, to which he devoted himself at the Universities of Paris, London, and Göttingen without attracting attention. In 1821 he was called to the Oriental chair at Berlin, and the following year was elected a member of the Royal Prussian Academy, both of which honours he retained until his death, which took place 23rd October, 1867. His first publication, issued at Frankfurt-on-Maine in 1816, was on the Sanskrit verb. He then brought out at Leiden (1820) an essay entitled "The Annals of Oriental Languages," a critical edition, with Latin translations and notes, of a story from the Mahābhārata. Other episodes from the same poem were published at Berlin in 1824 and 1829. In his capacity as professor he was the author of numerous publications, all of which are of great value to scholars; but his most important work was his "Comparative Grammar of the Sanskrit, Zend, Greek, Latin, Lithuanian, Old Slavonic, Gothic, and German Languages," which appeared in six parts at Berlin (1833,

1835, 1842, 1847, 1849–52). His method and researches have added comparative philology to the list of sciences, and will for ever connect his name with that important and fruitful branch of study. A second edition of this great work, revised and with additions, was published in Germany (1856–61), and a third edition was issued in 1871. It has also been translated into French (1856), and an English translation of the first edition was made by Lieutenant Eastwick at the instance of Lord Francis Egerton. It had the supervision of Mr. Wilson, the Boden professor of Sanskrit at Oxford, and was published in three vols. (1845–50). A second edition was issued in 1854.

BOP PART or BOPPARD (ancient, *Baudobriga*), a town of the Prussian province of the Rhine, on the left bank of that river, 9 miles S. of Coblenz, on the railway from Cologne to Mainz. This is a very ancient town, its walls appearing to be built on the foundations of a fort constructed by Drusus. In the middle ages it was an imperial city, and several councils have been held in it. The houses are mostly of wood and plaster, with projecting upper stories; and the streets are narrow and ill-paved. The large convent of Marienburg, founded in 1123, and some similar establishments, have been converted into cotton factories. The parish church and the old church of the Carmelites are worth notice. Population 3000.

BOR A, KATHARINA VON, the wife of Luther, was born of noble parentage at Lüben, near Schweinitz, Saxony, 29th January, 1499. She was placed by her family in the Cistercian convent of Nimpschen, near Gröden. Having become acquainted with the doctrines of Luther she entreated her friends to take her home, and on their refusal applied to him for assistance. Luther placed the matter in the hands of a respectable citizen of Torgau, named Leonhard Koppe, who succeeded in effecting her escape, along with eight other nuns who wished to leave the convent, in the night from Maundy Thursday to Good Friday, 1523. They were brought to Wittenberg, where Luther had provided for their reception, and Katharina was received into the household of the burgomaster Reichenbach. She declined the hand of Dr. Kaspar Glaz, which was offered her through the medium of Nicholas von Amsebeck, a friend of Luther, but declared herself willing to be married either to Amsebeck or to Luther himself. Luther accepted the offer, and they were married on 13th June, 1525. This union between a monk and a nun gave serious offence to the Catholics, and it is still one of the bitterest reproaches which they bring against the great reformer. The marriage, however, proved to be an eminently happy one; they had a family of three sons and three daughters; and on his death Luther left her all he had, and declared that she had ever been a kind and an affectionate wife. After his death she was supported by the Elector of Saxony and by Christian III. of Denmark, and after living at Magdeburg and Brunswick died at Torgau 20th December, 1552.

BORACITE occurs in beds of salt, gypsum, and anhydrite, in several localities in Europe, both in cubes and in an amorphous state. It is a *borate of magnesia*, white or grayish, and sometimes yellowish or greenish in colour, with a vitreous lustre, and specific gravity about 3, hardness 7 when crystallized, and about 4 when amorphous. The crystals become electric on heating, the opposite angles of the cubes becoming opposite poles.

BORAGINÆE, an order of regular-flowered *MOXOPETALÆ*, which are readily distinguished from all others by having their ovary deeply divided into four lobes, from the middle of which arises a single style. They are, moreover, characterized by their flowers being arranged in a gyrate manner before they expand. The common borage is often taken as the type of this order, and in fact represents not only its peculiarities of structure, but sensible properties; for all the known species agree in having an insipid juice, and their surface covered over with

stiff white hairs, which communicate a peculiar asperity to the skin, whence these plants were formerly called *Asperifoliae*, or rough-leaved. A few of the species, with perennial woody roots, yield from those parts a purplish colouring matter, used by dyers under the name of ALKANET. *Anchusa tinctoria*, *Lithospermum tinctorium*, and some kinds of *Onosma*, are the best known for this quality. Other genera are *Borago*, *Myosotis*, *Cerinth*, *Echium*, *Cynoglossum*, *Symphytum*, *Omphalodes*.

BORAGO, a genus of plants, the type of the order **BORAGINÆÆ**. The genus may be recognized by the rotate corolla, and the protrusion of the stamens. *Borago officinalis* (common borage) appears to be originally a native of Aleppo, but is now naturalized in most countries of Europe. In Great Britain it is not uncommon on rubbish and in waste places. Borage had formerly a great reputation as a cordial. Its virtues in this respect must have been overrated, as, in common with the whole family to which it belongs, it possesses no very active properties. It is often steeped to give coolness to claret-cup and other beverages. The tissues contain gum, and on this account it may be used as a demulcent. It also possesses nitrate of potash, as well as other plants of the order, which renders it slightly febrifuge. Withering says that the young tender leaves may be used in salads or as a pot-herb.

BORAS'SUS, a palm-tree, called *Palmyra* by the English, from the Portuguese name, *Palmira brava*. *Borassus flabelliformis* grows in the tropical parts of Asia, where it is esteemed of the greatest use on account of the vinous sap and the sugar which are extracted from it. The trunk, when full grown, is often 70 feet high. The leaves are fan-shaped, about 4 feet long, and placed on spiny stalks of about the same length. The fruit is about as large as a child's head, with a thick coating of fibrous pulp, and containing three seeds. The mode of obtaining the sap of this palm is stated by Rumphius to be by crushing the young inflorescence, and amputating the upper half; the lower half is then tied to a leaf stalk, and has a vessel, usually of bamboo, attached to its end. The vessel gradually fills with sap, and is removed every morning; when replaced, a fresh slice is cut from the wounded end of the inflorescence—an operation which is repeated daily until the whole of the raceme is sliced away. In procuring the sugar, exactly the same process is followed; but the inside of the receiver is powdered with lime, which prevents fermentation taking place; the juice is afterwards boiled down and finally dried by exposure to smoke in little baskets. The leaves are used for thatching, making fences, for manure, for weaving into baskets, mats, carpets, as packing, hats, umbrellas, and when prepared for writing upon. Old trees provide good hard wood, but the wood in the middle of the trunk is always soft, even in the oldest trees.

BORAX. See BORIC ACID.

BORDA, JEAN CHARLES, the mathematician, was born at Dax in France, 4th May, 1733. He studied military engineering, was admitted into the Academy of Sciences at Paris, and afterwards entered the French navy in 1767. He introduced into the French naval surveys the use of reflecting instruments, instead of determining positions by compass bearings. During the American War he served under D'Estaing as rear admiral. In 1782 the frigate which he commanded was captured by an English squadron. Borda, however, was honourably treated, and allowed to return to France on his parole, from which time to the end of his life he was mostly employed on the great measurement of the meridian. He died 20th February, 1799.

In 1676 Mayer had proposed a *whole circle* of reflection for astronomical purposes. Borda published in 1787 the account of his own improvement of the idea (since so well known), under the title of "Description et Usage du Cercle

de Réflexion." In 1790 he found by experiment the length of the seconds pendulum at Paris, which at that time was contemplated as the basis of the new system of measures. It has been said that to him and the electrician COULOMB must be traced the rise of the sound experimental philosophy for which the French have since become distinguished, and it certainly appears that there is some truth in the observation. In the meanwhile Borda had charged himself with the expense of calculating and printing new tables of logarithmic sines, &c., corresponding with the new division of the circle into 400°. These were published in 1801 under the title of "Tables Trigonométriques Décimales," &c., with revision and an explanation by Delambre.

BORDA'RII, the largest class of agricultural occupiers of land (except the villani) mentioned in the "Domesday Survey." They were "distinct from the servi and villani, and seem to be those of a less servile condition, who had a bord, or cottage, with a small parcel of land allowed to them, on condition they should supply the lord with poultry and eggs, and other small provisions for his board and entertainment" ("Gloss. Paroch. Antiq.") Such also is the interpretation given by Bloomfield in his "History of Norfolk." The total number of bordarii noticed in the different counties of England in "Domesday Book" is 82,631 (Ellis' "General Introduct. to Domesday Book," edit. 1833, vol. i. p. 82; ii. p. 511).

BORDEAUX, an important seaport town in France, the capital of the former province of Guienne and of the present department of Gironde, stands on the left bank of the Garonne, about 70 miles from the mouth of that river. It is 318 miles S.S.W. of Paris, about 35 S.W. by N. of Marseilles, and had 211,197 inhabitants in 1882. The city extends in the shape of a crescent about 1 mile along the river, which here bends with a rapid sweep from S.E. to S.W. A magnificent bridge of seventeen arches, and 602 yards long, joins the city to the suburb La Bastide, on the right bank of the river. Opposite, at the entrance of the town, is the Porte de Bourgogne, built to commemorate the birth of the grandson of Louis XIV. Along the river bank extends a line of quays above 3 miles in length. Below the bridge the river increases to 800 yards in width, forming a large and safe harbour, which is capable of containing 1200 ships, and has from 19 to 39 feet of water at high tides. Vessels of 600 tons can load and unload at all times close to the quays, which line the river on both sides for a distance of 3 miles. The Gironde Canal connects it with the Mediterranean.

Bordeaux consists of an ancient and modern part, separated from each other by the Rue Chapelle Rouge, which, running E. and W., forms with its continuation, the Rue de l'Intendance, one of the finest streets in Europe. To the south of this street lies the ancient part of the town. The northern part of Bordeaux, called the Quartier des Charrons, was formerly a suburb, cut off from the rest of the city by the Châteauneuf, a citadel erected by Charles VII. and strengthened by Vauban in the time of Louis XIV. The citadel has been demolished, and its site is now occupied by several fine streets, which connect the Quartier des Charrons with the rest of the town. All the streets of the town are well paved, and there is a good supply of water.

A distinguishing feature of Bordeaux is its *Cours* and its *Places*. The Place Tourny is adorned with a fine statue of M. de Flourens, to whom Bordeaux is indebted for many improvements.

Bordeaux contains many beautiful churches. The ancient Gothic cathedral was built by the English in the thirteenth century. Its whole length is 413 feet; the nave is 193 feet long, 53 wide, and 85 high. The interior is lighted through painted windows, and embellished with sculptures and bas-reliefs. The front is flanked with two square

feet high. A tower 200 feet high, called "la Tour Peyberland," from Archbishop Pierre Berland, who built it in 1140, stands at the east end of the cathedral, but apart from it, and serves it for a bell-tower. It was converted into a shot-tower during the Revolution. Of the other churches the most remarkable are those of St. Michel, built by the English in 1160, Sainte-Croix, St. Seurin, Notre Dame, and Des-Fenillans. This last is now the college church; it contains the tomb of Montaigne. At the western extremity of the town is the beautiful church of the Chartreuse Convent, the vineyard of which is now turned into a cemetery. Among the other public buildings must be mentioned the former palace of the archbishops of Bordeaux, which, after often changing its destination since 1791, became the town-hall in 1836; the theatre, a beautiful structure in the Corinthian style, and one of the finest buildings of the kind in France; the bourse, or exchange; the custom-house; the great hospital, situated in the highest part of the town, and facing the old fortress of Ha, which is now used as a prison; the museum, in connection with which are the public library, containing 200,000 volumes and several valuable manuscripts, cabinets of natural history and antiquities, picture galleries, an observatory, and schools of painting and design. The only vestige of the Romans in Bordeaux is the ruin of the amphitheatre, improperly called Palais-Galien (Palace of Gallienus). When the Revolution broke out it was nearly entire; after that event the materials of which it was built were used for erecting a mass of houses in the arena.

Bordeaux gives title to a metropolis, whose see comprises the department of Gironde; the suffragans are the Bishops of Agen, Angoulême, Périgors, Périgueux, La Rochelle, and Lagny. It is the seat of a high court and of a university. The latter was founded in 1441, and has faculties of theology, law, science, and literature.

Bordeaux is in an advantageous position for foreign trade. Bordeaux is a great fuel for international trade. By means of the Garonne, the Dordogne, and the Gironde, its commerce is extended over a great surface of the interior of France. It is on the Canal du Midi it has communication with the Mediterranean, and is able to rival Marseilles in the sale of colonial produce. Wine, brandy, and fruits are the chief articles of export. The wines known in France as Bordeaux, and which are extensively exported to all countries. Other articles of export are all kinds of manufactured goods, foreign and domestic, provisions, hardware, and cotton goods, such as hats, carpets, and linens. General products, cotton, dyestuffs, iron, glass, tobacco, rice, and a considerable quantity of wine from Spain and Portugal are the principal imports. From England the chief article is coal, nearly 600,000 tons being imported annually. About 200,000 tons of foreign coals, coming over 1,000,000 tons, annually arrive at and depart from the port, nearly one-half of the total freight being carried by British ships. The harbor is very extensive, and is capable of 10,000 tonnage in easily access to the town at high water. Bordeaux is not, in the usual sense of the term, a manufacturing town, having no special industrial products.

Bordeaux was one of the sites of the Roman *Burdigala*. The city was once destroyed by fire about A.D. 260, was rebuilt, and flourished. In the fourth century it became the capital of Aquitaine. The Visigoths sacked it on their way to Spain, and it did not recover its former greatness until Charlemagne's reign. Under Charlemagne it was destroyed by a great fire, and became again prosperous, and was in 850 the capital of Gascony. On the union of the duchies of Gascony and Guienne, the dukes chose Périgors for their capital, and Bordeaux became the capital of a county. By the marriage of Eleanor of Guienne, in 1152, with Henry of Normandy, afterwards Henry II. of England, Bordeaux with all the south-west of France, became subject to the English kings. In the

reign of Edward III. it was the residence of the Black Prince for eleven years, and here his son Richard II. was born. On the decline of the English power in France, the city submitted in 1451 to Count Dunois, and acknowledged the sovereignty of Charles VII. In the following year, on the arrival of the great Earl Talbot, the city revolted and joined the English; but after Talbot's fall before Castillon, Charles VII. in person invested Bordeaux, which, unprepared for a siege, submitted at discretion. At this time Charles erected the Château-Trompette and the fortress of Ha. In 1548 the township rose in insurrection on account of the oppressive *gabelle* or salt-tax, and massacred the governor, Tristan de Monneims. The dissatisfied were soon put down, and many of them punished with death. This punishment, however, was not deemed sufficient. The constable Montmorency, at the head of an army, entered Bordeaux, which offered him no resistance, though a breach made in the walls with his cannon, deprived the citizens of all their privileges, and amongst other horrors caused one citizen to be hung for every tenth house in the town. The privileges of the town, which consisted mainly of the right of self-government by a mayor and six jurats elected by their fellow-citizens, were restored in 1550 by a royal edict. In the war of the Fronde it opposed the court party, and was twice blockaded; and by an edict issued in 1675, the parliament of Bordeaux was removed to Coman, and subsequently to La Réole, and troops were quartered among the citizens to curb their rebellious spirit. The parliament returned to Bordeaux in 1690, and the city enjoyed repose and prosperity till the outbreak of the great Revolution. On the territorial division of France after that event, it became the capital of the department of Gironde. In the Franco-German war of 1870-71, when Tours, to which the seat of the Government of France had been transferred from Paris on the investment of the capital, became no longer safe, M. Gambetta and his colleagues moved to Bordeaux; and it was in the theatre of that city that the meeting of the National Assembly was held, on 28th February, 1871, at which it was agreed to accept the German terms of peace.

BORDELAIS, a district which was formerly comprised in the province of Guienne. It now forms part of the department of Landes, and nearly the whole of that of Gironde. Bordeaux was the capital.

BORDER, THE, a term used to denote the frontier common to England and Scotland while yet independent kingdoms. The line runs by the Tweed a little above Berwick to some miles above Coldstream. It then strikes off, and passes along the Cheviot ridge; leaves this and takes the Esk to Longtown, a few miles beyond which it meets the Sark at Greta; this it follows to the Solway.

BORDER WARRANT is a writ issued by the sheriffs of the Scottish Border counties to apprehend a person domiciled in England who has incurred debt in Scotland, if he should happen to be in the sheriff's jurisdiction. It is given on oath being made to the debt, and to the party's domicile. The principle of arrest in mesne process was never sanctioned in Scotland further than to the extent of apprehending debtors about to escape from the country until they should find security, termed caution (*caution de jure*), to abide the issue of an action or diligence at law. This process is called a *fugate* warrant.

BORDONE, PARIS, one of the most distinguished painters of the Venetian school, especially in portrait, was born of a noble family at Treviso in 1513. He was for a short time the pupil of Titian, but they disagreed and separated, and Bordone chose afterwards Giorgione as his master. He eventually adopted a style of his own, which he modelled on the styles of these two great Venetian masters. One of his best works is the "Martyrdom of St. Andrew," in the Church of San Giobbe at Venice. He died at Venice in 1570.

BORE, a phenomenon which occurs in some rivers, near their mouth, at spring tides. When the tide enters the river the waters suddenly rise to a great height, in some rivers many feet above the surface of the stream, and rush with tremendous noise and great velocity against the current for a considerable distance. It seems to be necessary, in order that there should be a bore, that the river should fall into an estuary, that this estuary be subject to high tides, that it contract gradually, and that the river also should become narrow by degrees. The rise of the sea at spring tides pushes a great volume of water into the wide entrance of the estuary, where it accumulates, and enters with the greater force the narrower the estuary becomes. When it reaches the mouth of the river, the swell has already obtained a considerable height above the descending stream, and rushes on like a wall. In England the bore is observed in some rivers, more especially in the Severn, Trent, Wye, and in the Solway Frith. The most remarkable bores are those of the Ganges, Brahmaputra, and Indus, and Amazon. In the channels between the islands at the mouth of the Brahmaputra the height of the bore exceeds 12 feet, and is so terrific and dangerous that no boat will venture to navigate them at spring tide. The boats of Alexander experienced these dangerous tides in the Indus (Arrian, "Anabasis," vi. 19).

BORE, the cavity or hollow chamber of any fire-arm. In many kinds of pistols, in shot-guns, and in cannon of the olden type it is simply smooth and cylindrical, but in all military small-arms and in all modern cannon the chamber is rifled. In guns of the Lancaster pattern it is oval in shape; and the gun designed by Mr. Whitworth, and called after his name, has an hexagonal bore. The term is used also technically to express the diameter of the chamber, and guns are described as being of so many inches in the bore, or shorter still, as being 7-inch, 9-inch, 10-inch guns. See GUNS.

BORE COLE, a variety of CABBAGE, with curly leaves, and no disposition to form a heart or head. It is chiefly valued for winter use. Several sorts are met with in gardens. These plants are raised in all respects like other hardy cabbages, and the duration of the crop is prolonged by sowing the seed at intervals of about a month, commencing at the end of March, and ceasing with the beginning of August. As they are apt to produce long naked stems, it is usual to earth them up, when full grown, so as to prevent the wind from blowing them over.

BOREL and **BORELLI**. There were two persons, who were contemporaries, who had the Latin name Borellus.

PIERRE BOREL, of Castres (born 1620, died 1689), was the author of many works, amongst them the treatise "De vero Telescopii Inventore" (Hague, 1655)—a work often cited. He was a physician by profession.

GIOVANNI ALESSANDRO BORELLI, of Naples (born 1608), was also a physician. He wrote "Enchirides Restitutus" (1628), discovered and translated the lost books of Apollonius, and also wrote the first theory of Jupiter's satellites, entitled "Theoria Mediceorum Planetarum ex Cassis Physiis deductæ" (1666).

Having become tired of a situation he held as mathematical tutor at Messina, he accepted a professor's chair at Pisa in 1656, where he lectured with great applause. It was about this time probably that he first conceived the design of employing mathematical principles in explaining the animal functions, and he now applied himself diligently to the dissection of animals. In 1670 he published his treatise "De Motionibus Naturalibus à Gravitate pendentibus," a prelude to his great work "De Motu Animalium," which did not appear until after his decease. In 1676 occurred the revolt of Messina in favour of Louis Quatorze, and Borelli took the French side. (He had some years before returned to Messina from Pisa.) He fled to Rome when the revolt collapsed, and was in great distress till

Queen Christina of Sweden took pity on him, and maintained him in tolerable comfort till his death. He died on 31st December, 1679.

The first volume of his work "De Motu Animalium" appeared in 1680 (Rome, 4to); the second volume, which completed the book, came out the following year. It is on this work that the medical reputation of Borelli depends. In the second part, indeed, where he endeavours to explain the action of the heart, lungs, liver, and other viscera, on mechanical principles, he is mistaken; but in the first part he successfully applies the principles of mechanics to the explanation of the active and passive movements of the body. He shows that the bones are true levers, and that the muscles attached to them may be considered as their moving powers; and he proves that the length of the limb, and the distance at which the muscle or power is inserted from the extremity of the limb, or centre of articulation, influence the quantity of force required for the contraction of the muscle, and the execution of the motion; just as in mechanics the length of the lever and the distance of the power from the fulcrum alter the quantity of force required. He demonstrated, too, that the muscles act at a disadvantage, considered merely as levers. In his attempts to estimate the force of muscles in numbers, he fails where success was probably impossible. He was a great admirer of Robert Boyle, and corresponded with him and with other English mathematicians.

BOREUS, a genus of insects of the order NEUROPTERA, suborder Plekoptera, and family Panorpidæ. This genus, of which only one species is known (*Boreus himalaicus*), is not only remarkable for its structure, but from the curious circumstance of its having been found in the winter months only, and is said even to have been seen on the Alps melting about on the snow; its most common abode, however, appears to be in moss. It is about a quarter of an inch long, and of a greenish colour, with the legs tending to red; and, unlike the rest of its tribe, the female possesses no wings, and those of the male are only rudimentary. The antennæ are long and thread-like; the parts of the mouth are produced into a kind of proboscis. The abdomen of the female is furnished with a large ovipositor. It is rather a scarce insect in this country. The scorpionfly, Panorpa, belongs to the same family.

BORGA or **BORGÓ**, a seaport of Finland, at the bottom of a bay of the Gulf of Finland, 35 miles E.N.E. of Helsingfors. It is the seat of a bishopric, and has a gymnasium, where Runeberg the poet lectured for many years. The harbour is indolent. Salted fish and tobacco are the chief manufactures. It was here that the Emperor Alexander I. received the oath of fidelity tendered by the states of the principality.

BORGHESE, an Italian family originally from Siena, where they ranked among the patricians of that republic. In the early part of the sixteenth century, Marc Antonio Borghese, a descendant of some distinction, settled at Rome. His third son, Camillo, born in 1552, became pope (Paul V.) in May, 1605. It is he who completed St. Peter's by the figure which so disfigures it, and who plundered Thomas Baroni to erect the pretentious Aquila Palatina on the Janiculum at Rome. The eldest son, Giovanni Battista, married Virginia Lanti of Pisa, by whom he had Marc Antonio Borghese, who, by the influence of his uncle the pope, was made Prince of Sulmona, and grandee of Spain. Marc Antonio began the line of the Princes Borghese, which still continues. His son Paolo married Olimpia Aldobrandini, the only child of the Prince of Rossano, and grand-niece to Pope Aldobrandini (Clement VIII.), and thus the Aldobrandini inheritance came into the Borghese family. Prince Camillo married, in 1593, Marie Pauline Bonaparte, Napoleon's sister, and widow of General Leclerc. Napoleon forced the unhappy prince to sell him his priceless collection of antiquities, and the

museum of the Villa Borghese, at Rome, for 13,000,000 francs. Thus the galleries of the Louvre gained most of their treasures. The prince accepted his fate, but wisely dug over his estates carefully, and was rewarded by a second crop of antiques, now forming the admired Borghese collection at Rome. The Villa containing it stands in splendid gardens just outside the city gates. On the fall of Napoleon, Prince Borghese returned to Rome, and afterwards fixed his residence at Florence, where he built a magnificent palace, and lived in great splendour. He died in 1832. The Borghese Palace in Rome itself, lying between the Corso and the Bridge of St. Angelo, is admittedly one of the finest palaces in the city. It was completed by Paul V. It is here that the famous picture gallery of the Borghese family is preserved—the most important collection in Rome except that of the Vatican. The gems of the collection are Titian's great pictures of the "Earthly and Heavenly Love" ("L'amore Sagro e Profano") and of the "Three Ages of Man," though the latter may be a copy. Of the many examples by Raphael, the only one perfectly unchallenged is the "Entombment," an acquisition by Paul V., being the last picture the artist painted at Perugia, and a work over which he spent his whole force, even attending death-beds in the hospitals for the more perfect representation of the sacred subject. The "Cunæ in Sibyl" of Domenichino is also in this gallery.

BORGIA or **BOR'JA**, a family originally from Valencia in Spain. Alfonso Borja was raised to the pontificate in 1445 by the name of Calixtus III. One of his sisters married Geoffrey Lenzoli, who assumed the name and arms of Borgia. Geoffrey had two sons, one of whom became prefect of Rome, and the other, Rodriguez, was afterwards Pope ALEXANDER VI. The eldest son of Alexander was made Duke of Gandia, in Spain, by King Ferdinand of Aragon; the next, Cesar Borgia, is famous in Italian history. His cunning, his profligacy, and his cruelty are proverbial, and he is suspected, on the best evidence, of having murdered his own brother out of jealousy at his being created Duke of Benevento. Cesar forced the pope to create him duke in place of his brother, by a threat that if he refused "the same dagger was ready for himself; and to enjoy his new power he did down the cardinalate which he had previously enjoyed. With all his abominable cruelty, Borgia loved and patronized learning, and himself was an elegant speaker and writer. He masked his insatiable ambition under soft and graceful manners. For some time Cesar Borgia was the terror of all Central Italy, from the Adriatic to the Mediterranean; he aimed at making himself, with the countenance of the pope, independent sovereign of Romagna, the Marches, and Umbria. He was aided in his design by the favour of Louis XII. of France, which he had gained by marrying him Alexander's daughter, divorced from his queen, Anne of Brittany. Louis created Cesar Duc de Valentinois, and gave him a body-guard of 100 men, and 20,000 livres of revenue. This was in 1494; and in the next year he married a princess of Navarre, and aided Louis XII. to conquer Romagna for the pope. In accordance with the fearful advice of Machiavelli, whose "Prince" was possibly written for Cesar Borgia, though it was dedicated to Lorenzo de' Medici the Younger, the heartless prince murdered every noble who fell into his hands. He garrisoned Urbino, and garrisoned that and the Romagna with foreign mercenaries. The patriotic opposition to him he succeeded in dividing, and had the baseness to murder those who had joined him, allured by his promises (so soon as by their help he had slain the others), at Sinigaglia, in the close of 1502. On the 18th August, 1503, Alexander VI. died, after a great supper, at which Cesar was present. Cesar himself fell dangerously ill at the same time, and it has been said, though without complete evidence, that they both drank by mistake some poisoned wine which they had intended for Cardinal di Corneto and

eight other new cardinals. The death of the pope ruined Cesar Borgia's fortunes. He was driven out of Rome by the new pope, the excellent Julius II., his troops were defeated, and he was imprisoned for two years in Spain. He at length escaped, and having entered the Navarrese army as a volunteer under his brother-in-law, in his war against Castile, was killed in 1507 by a musket shot at the siege of the small town of Viana, near the Ebro.

BORGIA, LUCREZIA, daughter of the pope and sister to Cesar, was married in 1493 to Giovanni Sforza, lord of Pesaro, with whom she remained four years, when her father dissolved the marriage, and gave her, in 1498, to Alfonso, duke of Bisceglia, natural son of Alfonso II., king of Naples. On this occasion she was created duchess of Spoleto and of Sernonea. In June, 1500, Alfonso was attacked on the steps of St. Peter's Church by a party of assassins, and stabbed in several places. He died two months after. Cesar Borgia was suspected of the crime. Towards the end of 1501 she married Alfonso d'Este, son of Ercole, duke of Ferrara. At Ferrara Lucrezia appeared as the patroness of literature. Cardinal Bembo, who was then at that court, conceived an attachment for her, which appears to have been of a Platonic nature (Mazzuchelli, art. "Bembo" and "Lucrezia Borgia"). Ten autograph letters of Lucrezia to Bembo are preserved at Milan, in the Ambrosian Library. In the latter years of her life she became more rigid in her manners, and more assiduous in the practice of devotion and charitable works. Her behaviour after she became duchess of Ferrara affords no grounds for censure. Her former conduct, while at Rome with her father, has been the subject of much obloquy, which seems to rest, however, chiefly on inferences from her living in a flagitious court, where she witnessed the most profligate scenes. There has been no individual charge substantiated against her, though even the names of her father and her brothers have been coupled with her own in the most terrible manner. At Ferrara she was highly praised by Strozzi, Tibaldeo, Ariosto, and other poets of the court. The famous drama by Victor Hugo, and the no less famous opera by Donizetti, have combined to blacken Lucrezia's character almost beyond possibility of recall, although not on well-authenticated evidence. Lucrezia died at Ferrara in 1523.

BOR'GO, an appellation which occurs in the name of several Italian towns. It is a word of Teutonic origin, *burg*, which is said to have been first adopted by the Romans on the German frontiers of the empire to signify an assemblage of houses not inclosed by walls. It was afterwards applied to the fortified villages of the German soldiers in the service of Rome. Vegetius (lib. 4, c. 10) calls *Burgus* "castellum parvulum." The Germanic nations, in their invasions of Italy, introduced the appellation into that country, where it was generally applied to the houses and streets built outside of the gates of a walled town. The French *faubourg* had a similar meaning. Several districts in the Italian cities have retained their original name of Borgo, although they are now inclosed within the walls. There are also Italian towns standing by themselves which have the name of Borgo.

BOR'GO SAN DONNINO, an Italian town in the province of Parma, situated on the Stione, about 15 miles W. of the city of Parma by rail. It has an ancient cathedral, a castle, several educational institutions, and an institution for mendicants. The population in 1882 was 10,937. It is supposed to be the *Fidentia* of the Romans, in which town M. Lucullus was besieged by Carbo.

BORGOGNONE, *negie*. Jacopo Cortesi, called from his place of birth Borgognone, was born in 1621, in the town of St. Hippolite, in Burgundy (Ital. *Borgogna*). He studied at Bologna, where Guido, then at the height of his fame, was residing. He is admired as a painter of battle pieces. Baldinucci, the painter, asked him, in a burst of admiration, "How he had given his battles so much truth, with expression so just, and accidents so

various?" and he replied that all he had painted he had really seen. In 1655 he became a Jesuit. He died 1676. Jacopo had a brother, Guglielmo Cortesi, also called Borgognone, a painter of merit, who sometimes assisted his brother, but never attained the same eminence.

BORGU or **BARBA**, a district in the interior of Africa, bounded on the N. by Guinea, on the E. by the Niger, on the S. by Yoruba, and on the W. by Dahomey. The country is chiefly flat, but is traversed by a range of mountains. Corn, yams, limes, and plantains are plentiful, and the soil is generally fertile. Cattle and all kinds of game are abundant. It was in Bousa, one of the states of Borgu, that Mungo Park was murdered.

BORIC ACID, **BORACIC ACID**, formerly called *Hombey's sedative salt* and *sedative salt of borax*, is a compound of the elementary body boron and oxygen. Boric acid (H_3BO_3) crystallizes in brilliant colourless six-sided laminae, which are greasy to the touch. This acid is inodorous; it has a slight and scarcely acid taste. When heated to redness it yields boron trioxide (B_2O_3) or boric anhydride, the only oxide of boron, a brittle glass. Its alcoholic solution burns with a beautiful characteristic green flame. It is very soluble in water, dissolving in 12 parts of cold and 2.57 parts of boiling water. It is also soluble in alcohol and volatile oils. It is very fusible, melting into a clear glass, in which most of the metallic oxides dissolve, giving characteristic colours before the blow-pipe. The chief source of boric acid is in the Maremma of Tuscany, an extensive and desolate tract of country embracing an area of about 40 square miles, over which jets of vapour and heated gases and springs of boiling water spurt out from numerous chasms and fissures. At some points the mouths of the fissures open direct into the air, at others they are covered by small muddy lakes or boric acid lagoons. The subterranean heat is utilized in the lagoons for evaporating and concentrating the liquors until the crude boric acid crystallizes out. Boric acid is also found among the ejecta around the crater of some volcanoes, and in jets of vapour which stream forth from fissures in the earth in regions of volcanic disturbance. The crude acid is used in the manufacture of borax, the pure acid in the manufacture of certain chemicals. In Sweden boric acid has been long employed for the preservation of meat and milk, and while it forms an efficient antiseptic, food prepared with it is said to be perfectly fit for use. An antiseptic preparation known as glacialine depends on this constituent, and more recently a combination with glycine, a boro-glyceride, has been introduced by Baril as a general antiseptic for preserving articles of food.

BORAX, or *Sodium Pyroborate* ($Na_2B_4O_7 \cdot 10H_2O$), the most important of all the borates, is obtained from Tibet and certain other parts of Central Asia, and as already observed, from crude boric acid. In recent years an important source of this mineral has been discovered in a body of water in California, now called the Borax Lake. It is situated in a region containing hot springs and the remains of volcanic action, and is 4000 feet long, 1800 feet wide, and about 3 feet deep. The bed of the lake is occupied with a deposit of borax crystals which are obtained by sinking caissons, pumping out the water, and digging up the deposit. Borax is one of the ingredients employed in making some of the finer varieties of glass. With oils and fats it forms a detergent soap, but it has a more corrosive influence on fibres than common soap. It is also used in soldering, and as a glaze for porcelain. In medicine it is useful as an external application in skin diseases, and the preparation known as *mel boracis* (a mixture of borax with honey) is an excellent gargle in ulceration of the mouth and throat. Since 1872 the importation of boric acid and borax have ceased to be distinguished in official statistical returns, and the actual quantity imported cannot now be ascertained.

BORING is the operation of perforating any hard substance, as wood or metal, as in the ordinary operations of the practical mechanic, or rocks and mineral strata, as in mining and the sinking of Artesian wells. In former times cannon were usually cast solid and bored by machinery, and in the modern built-up guns the inner steel lining is prepared in this way. In an accommodated sense the term is applied to the similar operations by which the cylinders of steam engines and other articles which are originally made hollow have their inner surfaces turned to a perfectly smooth surface and cylindrical shape. The boring-instruments of the carpenter consist of *awls*, which are pushed into soft wood, with a rotatory motion, without removing or bringing away its substance; *gimlets* and *augers*, which are supplied with cutting edges, and are partially hollowed to allow of the escape from the hole of the detached particles of wood; and *bits*, of various kinds, which also remove the wood, and are applied with greater power and precision by means of a crank-shaped instrument called a *brace*. Small holes in metal are usually bored with *drills*, which are formed with scraping rather than cutting edges, and are used either in a brace, a drill-stock capable of imparting an alternating rotatory motion by means of a bow worked by hand or some other contrivance, or in a lathe. Boring machines of the lathe character are too various and complex to be described here. In some machines the hardened steel tools are fixed either directly upon a boring bar or upon a disc attached to it, and to this a rotary and forward movement is imparted, so that the tool continually cuts a fresh portion of the metal. In other machines the tool is fixed, and the metal is made to rotate against it with a continuous inward movement. These machines have been brought to a high degree of excellence, and thus have rendered most essential service to the cause of science, and removed one of the greatest difficulties experienced by early improvers of the steam engine. Of the various boring operations of the miner, that of boring Artesian and petroleum wells is unquestionably the most interesting. The implements used in boring are shown in the accompanying woodcuts.

Well Boring. The site of the proposed well being selected, a frame of timber called a "derrick," 40 feet high, formed of four posts, inclining towards each other at the top, set upon a frame of logs 8 or 10 feet square, or sunk into the ground, is set over it. These derricks are prominent objects in the landscape of an oil region. At the top of the derrick is a pulley, over which a rope is passed when the boring tools or tubing are to be hauled up. A steam engine, usually of 6 or 10 horse power, is placed near the derrick, and its power is applied by means of a belt from the fly-wheel of the engine to a large wheel and crank; the crank giving motion to a walking-beam, at the end of which boring tools or pump rods are attached, as may be required. The lower part of the derrick is closed in sometimes with boards.

The first thing done is the driving in of the soil-pipe. This pipe (fig. 1) is 4 inches in diameter, made in 10-foot lengths, fitted at the ends, and driven by means of a heavy block of wood, as in fig. 2, driven. The lengths follow each other in succession until the rock is reached. This is sometimes 30 feet below the surface, and the soil-pipe has to penetrate earth, sand, loose slate, &c. The drilling tools are attached to each other by means of a screw connection in the following order: Bit (fig. 2), or reamer (fig. 3); auger stem (fig. 4); jars (fig. 5); sucker-rod, similar to auger stem, but shorter; rope socket (fig. 6), to which the rope is attached at one end, and at the other to the temper screw (fig. 9). The annexed diagram gives the position of the engine, walking-beam, and connection, as they are commonly arranged, together with the relative positions of the boring tools when in use (fig. 11).

The temper screw is attached to a rope which connects

with the end of the walking-beam, and serves to regulate the descent of the drill without the inconvenience of lengthening the rope at short intervals. The sinker bar

slide together, and they fall the distance necessary to penetrate the rock, and are again lifted by the jars on the upward stroke, falling again as the stroke descends.

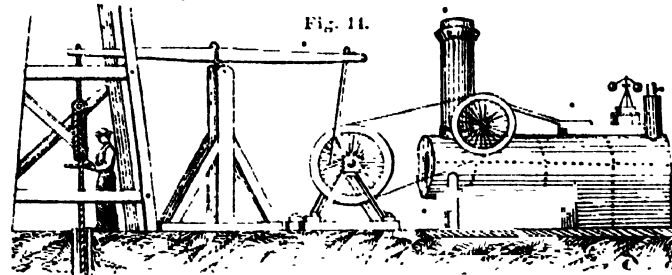


Fig. 11.

The soil-pipe is cleared of its contents by the tools and sand pump (fig. 7), which is a hollow tube with a valve at its lower end. This permits it to fill with the finely pulverized detritus made by the drill, and it is alternately lowered into and raised from the well and emptied, until the well is clear for the tools again. When the soil-pipe is clear, drilling the rock is begun in the way described. An ordinary set of tools weigh 900 or 1000 lbs. A circular motion is given to them by means of a lever passed through the rope near the temper screw at the top of the well, and moved round gradually by one of the workmen. The reamer is used to enlarge the hole made by the bit.

Occasionally, in drilling, the tools will enter a crevice in the rock and become wedged so tightly that they are often lost for want of means to extricate them. Numerous appliances have been invented to accomplish this. The "lazy tonga" (fig. 8) is one of these. It is attached by a screw pin to the sinker base, or other suitable rod of iron, and lowered so as to catch the end of the missing tool in its jaws. It is said by the workmen that to sink 100 or 200 feet is comparatively easy, but that at 400 feet the risk of loss of tools is much increased. At that depth the jar of the falling bit and auger stem is not nearly so perceptible at the well top, the elastic rope taking it up. The well having been sunk to the oil, which does not always manifest itself by flowing, it is tubed with 2 inch wrought-iron pipe (fig. 12) fastened together by screw joints in 10 or 12 feet lengths.

The first length sent down is the brass or iron cylinder, which constitutes with its valves the "oil pump" (fig. 11). This is about the same size as the well tube, and has at the bottom a ball valve fitted into a brass plug having a screw top. The pump rods, which are tough wooden rods fitted together by iron sleeves and screws, connect at the lower end with the upper valve of the oil pump, which has a screw socket at its lower end, so that it can be lowered down to the bottom valve, screwed over its top, and pulled up when necessary.

The dotted lines of the oil pump (fig. 11) show the position of its valves when the up stroke is at its highest pitch. When the oil pump is adjusted the required lengths of tubing are connected one by one, and the tube lowered into its place. In some wells a strainer of wire cloth is placed round the lower part of the oil pump. The pump rods work through a stuffing box (fig. 13), which is screwed to the top of the well tube. The oil pump is not allowed to rest on the bottom of the well.

gives weight to the upper part of the jars, which slide together, and the auger stem and bit afford weight to do the drilling. The downward stroke of the walking beam releases the auger stem and bit for an instant as the jars

To prevent communication between any particular portion of the well and the tube a bag of linseed, called a seed bag, is sent down to the required place. This bag, encircling the tube, soon swells by the water which is always present,

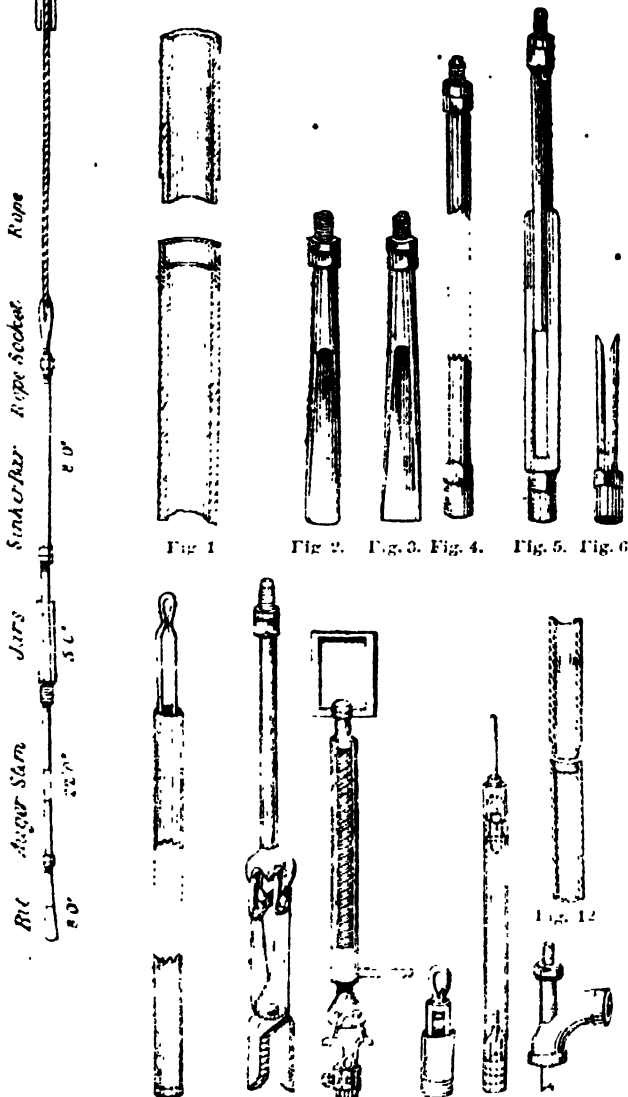


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10. Fig. 11. Fig. 12. Fig. 13.

and forms a water-tight joint in the well. For instance, when it is desirable to prevent the water beds from one of the upper rocks from flooding the oil bed of the lower strata, the seed bag is inserted below where the water is supposed to be, and prevents it from reaching the oil pump at the bottom of the well. For drawing the tube a "swivel" (fig. 10) is used. It screws into the tube.

When the soil is not deep a circular excavation is made down to the rock bed, and a hollow log or "gum," as it is called, placed in it on one end. The base is surrounded with clay to prevent the influx of surface water. The seed bag is also used to keep the lower part of the well free from water.

When steam engines are not to be had conveniently, a spring pole is used to give the proper motion to the boring tools. It is worked by two men, while another gives the circular motion to the tools by turning the lever at the top of the rope.

BORNEËNE or **VALERINE** ($C_{16}H_{16}$) is a liquid hydrocarbon obtained by distillation from Borneo camphor, also from the essential oil of Valerian. It is isomeric with oil of turpentine, which it resembles. It is lighter than water, boils at 165°C . (329°Fahr.), and forms a crystalline compound with hydrochloric acid.

BORNEO is the largest island in the Indian Archipelago, and the largest on the globe, if we except the continent of Australia. It occupies the centre of the Indian Archipelago, and is divided by the equator into two nearly equal parts, though the most southern point, Cape Salatan, is only a little more than 4°S . of the equator, and the most northern, Cape Sampanmangio, extends a few minutes to the north of 7°N . lat. The most eastern extremity, Cape Komuogog, reaches nearly $119^{\circ} 30' \text{E}$. lon.; and the most western shore, about 1°N . of the equator, is in about $102^{\circ} 30' \text{E}$. lon. The island is 850 miles in its greatest length, and 680 in its greatest breadth; and its area is about 280,000 square miles, or considerably larger than the whole German empire.

Physical Features.—The coast of Borneo is very little indented with bays, and nowhere by deep inlets, and it has few good navigable rivers. The few bays it possesses are towards the north-eastern extremity, where the coast is somewhat higher and more abrupt. As a rule the island is throughout bordered by a considerable width of swamps and lowlands, except at a few points where there are high promontories or a small extent of hilly country.

The interior is hilly, with many abrupt and precipitous mountains, either in isolated peaks or in short ranges. The chief continuous range is in the north-west, where, in the Sarawak and Sadong valleys, the ridge averages 2000 to 3000 feet, with peaks rising above 5000 feet. Further north, to the south-east of Brunei, the mountains rise 7000 to 8000 feet high. Considerably further northward, only 18 miles from the coast and 50 from Malludu Bay and the extremity of the island, rises in solitary grandeur the rocky mass of Kinabalu, some 13,600 feet high, and the highest mountain not only of Borneo but of the entire Malay Archipelago.

The three largest rivers in Borneo are the Kapuas, a river of Pontianak on the west; the Barito, a river of Banjarmasin on the south; and the Kuti River on the east. All these appear to rise near each other, somewhat north of the centre of the island; they all have countless tributaries, and all, in the lower part of their courses, flow in very winding channels through a vast extent of forest-covered and swampy alluvial plains. On the northern coast the rivers are much shorter, but being fed by the copious equatorial rainfall, are still large and imposing. The most important are the Batang Lapor, to the east of Sarawak; the Rejang, a little further east; the Baruan, which enters the sea at Baruan Point; and the Limbang, at the mouth of which stands the native city of Brunei. Besides these, there are hundreds of smaller

but still considerable rivers all round the coast of Borneo, but hardly any admit of the entrance of large vessels except the Brunei and Pontianak rivers for a short distance, and the small river of Sarawak.

The general scenery of Borneo is interesting, and often picturesque, from its luxuriant forests and the prevalence of abrupt basaltic or limestone hills, whose precipitous sides, clothed with shrubs and creepers, give variety to the landscape; but except in the vicinity of some of the lofty mountains, it does not present the same amount of grand, varied, and extremely beautiful scenery to be met with in Java and Sumatra, or in the Philippine Islands. The climate is found to be far more healthy for Europeans than that of many tropical places. Taking Sarawak as a fair example, the rainfall ranges from 160 to 200 inches a year; but in spite of this humidity it is salubrious. The usual daily temperature ranges from about 72° in the morning to 80° at mid-day; it rarely rises over 90° or falls below 69° .

Productions.—Excellent coal is very abundant, occurring plentifully in the Sarawak territory, at Labuan and Brunei, at Banjarmasin on the south coast, and at many intermediate points. Mercury is also found, and antimony in large quantity; gold in the extreme west, in Sarawak, Samba, and Pontianak; and diamonds in the same districts; while native iron is smelted and manufactured by the Ryans and several other tribes of the north-west interior.

The vegetation of Borneo is exceedingly luxuriant, the whole island being, with few exceptions, one vast forest. It is especially rich in palms and forest trees, the vegetation being of course thoroughly Malayan; but there is often a curious mixture of Indian, Malayan, and Australian plants. The native vegetable products of the Bornean forests are very numerous, including gutta-percha, india-rubber, dammar, camphor, benzoin, eagle-wood, sago, rattans, ebony, and an abundance of fine timber. Of cultivated products pepper is the chief, but cotton, sugar, and rice are grown for native use; there is much land available for coffee, and even vegetable and fruit of the tropics may be here cultivated. Nowhere are those delicious native fruits, the mangosteen and the durian, more abundant than in Borneo.

The remarkable feature in the zoology of Borneo is the absence or rarity of many large animals found in the adjacent islands. Thus the tiger and leopard of Java and Sumatra are unknown, and elephants are found only on the eastern peninsula near Gong Bay. Wild cattle are also confined to the northern part of the island, where in some districts they are abundant. Borneo is very rich in monkeys, and has many peculiar species, the most remarkable being the proboscis monkey, whose long and flesh-like nose gives it a very milke aspect; and the orang outang, or "manas" of the natives, next to the gorilla the largest living ape. Cynocephalous insectivora, squirrels, otters, deer, and wild swine are also abundant. Birds of very beautiful plumage and reptiles are abundant, insects excessively so, many of the latter being of the largest size and very gorgeous.

Inhabitants.—The aborigines of Borneo are all of Malay race, and are generally known as Dyaks; but they are divided into numerous tribes, speaking distinct languages and having different appellations. They hardly differ physically from the Malays, except in being darker and more active; and they are generally of a more cheerful and docile disposition. In the north-west the Dusun or Idjan tribes—the Kaitums and Pakitums—correspond to the Land Dyaks of Sarawak, while the Milenaws correspond to the Sea Dyaks. In the north interior, on the Upper Kuti and Barito, and the head waters of the Rejang and Birtala, are the Kayan Dyaks, who are one of the most advanced savage races, and are celebrated for making iron and for fabricating admirable weapons. They are very warlike, addicted to head-hunting and making slaves, so that they are the terror of all their neighbours, and make a desert of their borders. All the tribes mentioned are tattooed, and

are heathens, but there are several semi-civilized Moham-medan tribes of Malays in Borneo. The Malays, proper occupy almost all the coasts, and the Malay sultan of Brunei long ruled the entire north-western districts from Sarawak to beyond Malludu Bay, and exacted tribute from the Dyak and other tribes far into the interior. The practice of taking heads as trophies was common among almost all the Dyak tribes, but has now been abolished where European influence is predominant. A young Dyak could not marry, nor a parent or widower leave off mourning, till a head was obtained. These heads were dried and carefully preserved in their houses. It was a custom, and as a custom was observed, but it did not imply any extraordinary barbarism or moral delinquency. On the contrary, it is the general opinion of all who know them well that the Dyaks are among the most pleasing of savages, that they are kind, truthful, and have many excellent qualities. The Dyak houses are generally very large, many families residing together, and there is in every village a council-house, where the young unmarried

men sleep, where councils are held, and where travellers are lodged. The houses are almost always raised on posts, often to a great height where subject to attack from other tribes, or they are built perched up on almost inaccessible mountains, only to be reached by ladders up the face of lofty precipices. The Dyaks cultivate rice and many kinds of vegetables, and have large plantations of fruit, often covering whole mountain sides, and furnishing them with an important part of their food. They also grow tobacco and sugar-cane for luxuries. Their weapons are spears, the blow-pipe, snares, and pitfalls, and with these they capture all kinds of wild animals for food. They collect bees' wax, edible birds' nests, and other produce of the forest, and exchange them for tools, clothing or ornaments, and especially for brass wire, gongs, and brass guns, the main wealth of Dyak chiefs.

Several other peoples have settled in Borneo, which, from its central position, has naturally become the receptacle of wanderers from all the surrounding islands. Among the leading immigrants are the Bugis of Celebes, who have made



Kini Balu, Obsoeken Bay, Borneo.

the Dutch settlements on the south and east of Borneo, and are especially numerous on the rivers Pasir and Kotu, where they are the chief traders. Further north are the head-hunters of the *Sakobos*, who speak the *Besak* language of the Philippines, and who hold an extensive tract of country round Cape Ungay under the rule of the Sultan of Sulu. Chinese are to be found in every town on the coast, for some are merchants, mechanics, or agriculturists. They are most numerous in the western part of the island, where gold and diamonds are to be found, and there are 150,000 in the Dutch territories alone. There are also a considerable number in the Sarawak territory, where in 1857 they rose in insurrection, obtained temporary possession of the chief town, Ruching, and nearly succeeded in killing the English rajah, Sir James Brooke. They were, however, utterly defeated, and the island has since been much safer. Many of them have Dyak wives, and there is now a considerable mixed population.

European Settlements in Borneo.—The Dutch claim suzerainty over the greater part of Borneo, and have estab-

lished a regular government over the coast districts of the west and south. They first visited Borneo in 1598, and traded with the natives for gold, diamonds, and pepper. In 1785 they obtained some territory at Banjarmasin, by treaty with a native chief, and since then have gradually increased their possessions and influence. Their chief town in the western district is Pontianak, which is under the nominal rule of a native sultan. Its subdivisions are Sambas and Montrado on the north, Pontianak on the west coast, and Sintang in the interior, comprising the whole upper portion of the Kapuas valley. The chief place of the southern districts is Banjarmasin, a town of about 6000 inhabitants, many of whom are Chinese, the rest Malays. The interior is occupied by numerous tribes of Dyaks, and is governed by several Malay sultans, with varying degrees of independence. The Dutch claim the whole southern portion of the island, as far west as the frontier of Sarawak and as far east as the river Atas, in 3° N. lat. The remainder, till recently, was divided between the state of Sarawak and the Sultans of Brunei and Sooloo.

It may be observed, however, that while Holland has ever been ready to claim rights of suzerainty, it has never sought to justify them by the only course which could give any valid title—useful occupation. She has not even made any lodgment, except on one or two insignificant points on the coast; the rest has been left in a state of primitive barbarism. There is, in fact, every reason to believe that Dutch influence has had the most disastrous effect upon this grand island. In 1520, when the Portuguese first visited Borneo, the whole island was in the most flourishing condition. An immense commerce was carried on with China, and the produce of Bornean industry and trade enabled the princes of the island and their courts to display no small splendour and magnificence. All this has long since vanished, and all that remains of the rich and populous city of Brunei, with its 25,000 houses, is a poor straggling town of about one-tenth its former size. The decay of Bornean prosperity is chiefly to be traced to the only use the Dutch ever made of the islands they compelled all traders to send their produce, intended for the China markets, to Malacca and Batavia, to be bought by the Netherlands authorities at their own rates. The rajahs, finding the freedom of their commerce gone and their revenue reduced, turned their attention from trading to maritime and piratical enterprise. Agriculture was neglected, and lands hitherto profitably cultivated were allowed to run to jungle and to waste. Had the Dutch been strong enough they would probably have carried out in Borneo the same system of forced cultivation adopted in Java, and which for many years formed the mainstay of the Netherlands exchequer. With Java in hand, however, Borneo was rather too big a nut to crack on the same principle; and the Dutch were content with the dog-in-the-manger policy of neither occupying it usefully themselves, nor, if possible, allowing any one else to do so.

Until within the last few years, therefore, the largest of all the islands of the Malay Archipelago—with the exception of a few spots on the coast—remained almost unknown. A great part of its interior had never been explored. If we except Sarawak, acquired in 1842 by Rajah Brooke, on the north-west coast, and Labuan, a small island off that settlement under the British flag, Borneo, with its 300,000 square miles, was not only a *terra incognita*, but a vast territory only partially occupied by any native tribes, and wholly uncultivated, with virgin forests and jungle. It seems strange that no European power should have thought it worth its while practically to occupy so large and fruitful an island in the very centre of the richly endowed archipelago, and on the great fairway of an immense commerce with China and a rapidly-increasing trade with the Australian colonies. A very large part of it was really no man's land, and was open to any bid for possession, by treaty or purchase, from sultans, rajahs, and divided tribes, quite incapable of offering even a show of resistance to any civilized power.

Step by step, however, the whole of Borneo, except the part originally claimed by Holland, has now passed under British influence. The initiative was taken by Mr. (afterwards Sir James) Brooke, who in 1839–42, by an enterprise of the most perfectly unique and interesting character, rendered it possible for an English gentleman to rule as absolute monarch over a large population of Malays and Dyaks to the complete satisfaction and contentment of both their seemingly conflicting interests. The experiment was one of the most singular triumphs of peaceful settlement ever known, and gives remarkable testimony to the pre-eminent fitness of Englishmen for dealing with uncivilized peoples in any scheme of colonization. How Sir James Brooke became the undisputed and beneficent ruler of a large portion of the island of Borneo is narrated in our article upon SARAWAK. The second step towards British influence here, and the first officially taken, was in 1846, when our government purchased the small island of LABUAN, off the mouth of the

Brunei river. A further official recognition of the importance of the position was made in the following year, and was thus described in a Foreign Office despatch of 7th January, 1882, in reply to some shadowy claims set up by Spain:—"North Borneo lies in the fairway of an immense British maritime trade between China, Australia, India, and the United Kingdom. Its occupation by a foreign power would be a source of disquietude to this country, and for that reason clauses were inserted in the British treaties of 1847 and 1849 with the Sultans of Sooloo and Brunei, under which they respectively engaged not to make any cession of territory to any other nation than Great Britain without the consent of her Majesty's government."

In 1881 the British North Borneo Company appeared upon the scene, and by purchase and treaty in friendly negotiation obtained from the Sultans of Sooloo and Brunei all their rights, privileges, and jurisdiction over the whole northern end of the island outside the limits of Sarawak and above the line in the south claimed by the Dutch up to that period. Doubtless for the reasons mentioned in the despatch quoted, a royal charter of incorporation was granted to the company, and from 1882 North Borneo became practically a British possession, and now forms a valuable addition to our chain of stations on the vast highway of British commerce.

The territory thus transferred to the North Borneo Company consists of some 20,000 square miles, sparsely populated, and but little cultivated. Its natural capacities and resources, however, are very great, and when the advantages insured by a firm and just administration come to be understood, there will doubtless, as in the case of Snawak, be quite a sufficient influx of population. The area is larger than that of Ceylon, and rather less than Iceland; and there are 500 miles of coast, several capacious and excellent harbours, numerous rivers, and a range of mountains from 5000 to 8000 feet in height, with a lofty peak rising 13,700 feet above the sea, as picturesque in form as the sacred mountain of Fusi-yama in Japan, and equally an object of superstitious reverence to the native. On the extreme north of Borneo, close to the great fairway of British trade with China and Japan, is the Bay of Malacca, 30 miles in length, from 1 to 6 in breadth, with numerous rivers flowing into it. In 1881 there was discovered within this bay the very fine deep harbour of Kudat, and here it was decided to establish the chief seat of government. Gaya and Ampoen on the west coast, and Sandakan on the eastern coast, have also splendid harbours; and with these amongst many other natural advantages for trade, with thousands of square miles of seemingly fertile soil, and with a climate which for the tropical situation is magnificently healthy, there seems a most promising future before our newest British colony. ("Pioneering in the Far East," by Ludwig V. Helms; London, 1882.)

BORNEOL or BORNEO CAMPHOR ($C_{10}H_{16}O$).

This substance is found in cavities of the *Dryobalanops camphora* tree of Borneo and Sumatra (natural order Burseraceæ). It can be obtained artificially by heating ordinary campher with alcohol and potash. It crystallizes in six-sided prisms, which melt at 198° C. (388° Fahr.), and boil at 212° C. (414° Fahr.), distilling unchanged. Heated with phosphoric anhydride it yields borneene.

BORNHOLM, an island in the Baltic belonging to Denmark, is situated in 55° N. lat., 15° E. lon. It is about 27 miles long and 13 broad, and contains an area of about 220 square miles. Bornholm is very rocky and mountainous, and it is so walled in by precipitous cliffs and dangerous reefs that at certain seasons of the year the approach to it is extremely hazardous. The Abundinger Mountains cross the island from N. to S. This range does not form a continuous elevation, but is intersected by fertile valleys lined with underwoods of oak. The remainder of the island has a stony soil, partially intermingled with

tracts of deep loam, and on some spots with drifting sand. The porcelain clay used in the Copenhagen porcelain manufacture is obtained here. The climate is cold, but healthy. The island produces oats, rye, barley, pease, flax, hemp, hops, and potatoes. The cattle are small, but of good quality; sheep are numerous. Bornholm has 33,000 inhabitants, who are of Danish extraction. The chief town of Bornholm is Rønne, or Rottum, a fortress on the west coast. The town is irregularly built; it has 5500 inhabitants, who subsist by trading in grain, brandy, and pottery, and upon the produce of their fisheries. The harbour is small, and varies in depth from 6 to 9 feet. The three small islands—Christiansø, Friederichs-holm, and Grøns-holm—are about 17 miles east of the north point of Bornholm. Christiansø and Friederichs-holm are inhabited. Bornholm has changed owners several times. A separate kingdom in the ninth century, it successively passed under the power of Denmark, the Hanseatic League, Lübeck, and Sweden, finally coming under the control of Denmark.

BORNITE or **ERUBESCITE** (a sulphide of iron and copper) is a very valuable ore of copper, generally found massive, but sometimes crystallized in cubes and octahedra. It is of a pale reddish-yellow colour, but tarnishes quickly in the air, acquiring tints of blue and red thence its name, from *crabesco*, to bluish, and its Cornish appellation "horse flesh ore." It has a hardness of 3, and specific gravity 4.4–5.5. Its constituents vary greatly, but it contains from 50 to 70 per cent. of copper. In the British Isles it has been found mostly in Cornwall. It is very plentiful in Central and South America.

BORNIOU, a kingdom situated nearly in the centre of North Africa, between 10° and 15° N. lat., and between 12° and 18° E. lon. It is bounded on the N. by the Sahara Desert, on the E. by Lake Chad, on the W. by Howssa, and on the S. by Mandara. The whole country is nearly level, and is frequently overtopped by the lake and rivers in the rainy season. Its area is estimated at 51,250 square miles, and the population at 5,000,000. The two principal rivers are the Sannay and the Yout; into these, or into Lake Chad, all the other rivers empty themselves. This lake is very large, extending 200 miles in length from N.W. to S.E. The heat of the country is very intense, except about Christmas; the hot winds and the heavy rains are its scourges.

The soil is in general fertile and well watered, yielding large crops under the rudest cultivation. The only improvement of agriculture is an improved mode made from the iron used in the Mandara Mountains. All the labours of the country are performed entirely on women. The most valuable products are maize, cotton, indigo, rice, millet, mangoes, and dates. The wealth of the country consists chiefly in the domestic animals, of which the bullocks and horses are very numerous. Bornio horses are famed, and in great demand throughout all the Sonnary. Dogs, sheep, goats, and camels are much used. Wild animals also abound in the extensive woods and marshes. Lions, leopards, antelopes, cheetahs, hyenas, jackals, crocodiles, and hippopotami are common, and antelopes, gazelles, ostriches, and other animals are pursued as game. Bees are very numerous, and honey is one of the principal Bornioese articles.

The principal people of the country are thorough negroes. There are, however, black, light, and mixed races, but good teeth and high foreheads. The Senegal, who occupy the pastoral districts, are Bornio, and speak nearly pure Arabic; but the people of the lake are known, of which there are several dialects. The people are Mohammedans, strict as to external rites, and very obedient. Polygamy prevails, but even the richest seldom have more than two or three wives. The commerce of the country is carried on in barter between the Moors of North Africa and the black tribes of the interior.

Bornio has filled no unimportant part in African life,

and it has a clearly defined history going back to the ninth century. Up to 1808 it was ruled by a sultan, but soon after this a powerful sheikh obtained the ascendancy, and the sultan occupied but a nominal position.

Some of the towns—especially Kuka, Angornou, and Birnie—are very large, having as many as 60,000 inhabitants, and appear to have been places of considerable strength. The country was visited and described by Denham and Clapperton in 1828, Barth in 1857, Rohlf in 1873, and Nachtigal in 1874–75.

BORO BUDDOR, the ruin of a magnificent Buddhist temple in the interior of Java, near the junction of the Ello and Progo. It is regarded as being the finest example of Buddhist architecture in existence, and dates from a period anterior to the tenth century. By the Javanese it is believed to have been built during the seventh century. It is in the form of a quadrangular pyramid, 561 feet broad at the base, rising by a succession of eight terraces to a height of 121 feet, the centre being surmounted by a dome or pagoda. The walls of these terraces are decorated on the outer side by a number of niches containing statues of Buddha larger than life. There are about 400 of these, and the space below them is filled by a representation of scenes from his life carved in bas-relief. The inner walls are also profusely ornamented, and the three upper terraces are surmounted by seventy-two small domes, each containing a seated figure of Buddha. The upper chamber in the centre is now empty, but is believed to have originally contained a sacred relic. For a full account of this interesting building see Crawford in the "Ruins of Buddha in Java" in the *Transactions of the Literary Society of Bombay* (London, 1823), Fergusson's "Handbook of Architecture," and the "Prachtin-gave van Javasche On-heden" by Mieling (Haag, 1852).

BORODINO, a village in the Russian province of Moscow, in 55° 25' N. lat., and 35° 40' E. lon., is situated on the Kolotska, within a short distance from the banks of the Moskwa, about 70 miles west of the city of Moscow. This village will be for ever memorable from its being the scene of one of the most sanguinary conflicts that took place in the Napoleonic wars. On the 7th September, 1812, the French army under Napoleon, in its advance upon Moscow, attacked at this point the intrenchments of the grand Russian army, 120,000 strong, under Kutousoff. The Russians made a desperate resistance, but in the end their position was carried. The slaughter was immense, the Russians having lost above 10,000 men killed and wounded, and the French nearly 30,000. Few prisoners were made on either side.

BORON is an elementary body, and is found in nature, in combination with oxygen, as boric or boracic acid, also with sodium in native borax or tincal, with magnesium in boracite, and with calcium in boro-calcite. This element was first isolated in the amorphous state by Davy in 1807, but its properties were not much known till 1808, when Gay Lussac and Thenard discovered a better mode of procuring it. It is obtained from boric acid by heating it with potassium or sodium, or from boro-fluoride of potassium by heating it with potassium.

Boron is obtained as a deep-brown powder, with a shade of green. It is devoid of taste or smell, and a non-conductor of electricity. It is not altered by exposure to the air or to oxygen gas at ordinary temperatures, but when heated to about 300° C. (572 Fahr.) it absorbs oxygen, and burning with a green flame of considerable brilliancy, it is converted into boric acid. The symbol is B; atomic weight, 11. It is triatomic, and unites with oxygen, nitrogen, chlorine, bromine, fluorine, and sulphur.

BOROUGH. This term, derived from the Anglo-Saxon "byrig" or "burh," which originally meant the fortified castle of a nobleman, afterwards came to include all the houses, churches, &c., gathered round it for protection.

As a suffix it appears in many places in the midland counties, as Peterborough, Loughborough, Gainsborough; the corresponding term in the southern counties being "bury," as Canterbury, Salisbury, Aylesbury. In Scotland it appears as "burgh" in Edinburgh (Eadwine's burgh), Helensburgh, Fraserburgh, Jedburgh. These aggregates appear to have obtained a corporate existence as far back as the Saxon period, and after the Norman conquest they gradually acquired dignity and importance, their trade and other privileges being guarded by charters obtained from the various rulers.

The term in more recent periods implied a city or other place which enjoyed the privilege of sending burgesses to Parliament, but by the Municipal Reform Act, 5 & 6 Will. IV. c. 76, s. 142, the word borough is defined to mean a city, borough, port, cinque port, or town corporate, whether represented in Parliament or not. Those which are entitled to send members are distinguished as parliamentary. See MUNICIPAL CORPORATIONS.

BOROUGHBRIDGE, a small market-town in the West Riding of Yorkshire, on the river Ure, 17 miles N.W. of York, on the North-eastern Railway. The town is decaying, and had only 966 inhabitants in 1881. It was a place of importance when the great north road passed through it, and returned two members to the House of Commons till 1832. Many Roman and British antiquities have been found near it. Of these the most celebrated are the obelisks called the Arrows, about half a mile south of the town. At Boroughbridge, on the 16th of March, 1322, the army of the rebel barons, under the Earl of Lancaster, was defeated by the troops of Edward II. in an attempt to cross the river, and their leader, being taken prisoner, was immediately beheaded.

BOROUGH-ENGLISH is a custom in some parts of England by which lands and tenements held in ancient burgage descend to the youngest son instead of to the eldest, wherever such custom obtains. It still exists in a few cities and ancient boroughs, and in the adjoining districts. The land is held in socage, but descends to the youngest son alone. In some places this rule of descent is confined to the case of children; in others the custom extends to brothers and other male collateral relations. The same custom regulates the descent of copyhold land in various manors. The custom is mentioned by Glanville and by Littleton (s. 165).

This custom does not appear to have been known by its present name until some time after the Conquest; for the Normans, having no such custom in their own country, distinguished it as "the custom of the Saxon towns." In the reign of Edward III. the term Borough-English was used in contrast with the Norman law. Thus it was said that in Nottingham there were two tenures—"Burgh-Engloies" and "Burgh-Françoies," the usages of which tenures are such that all the tenements whereof the ancestor dies seized in "Burgh-Engloies" ought to descend to the youngest son, and all the tenements in "Burgh-Françoies" to the eldest son, as at common law (1 Edward III. 12 a). Primogeniture was the rule of descent in England at common law; but in the case of socage lands all the sons inherited equally until long after the Conquest, wherever it appeared that such lands had, by custom, been anciently divisible. But this general rule of descent was often governed by peculiar customs, and in some places the eldest son succeeded his father by special custom, while in others (those subject to Borough-English) the youngest son alone inherited (Glanville, lib. vii. c. 3, and notes by Branes).

Tylor, in his "Anthropology," says—"This right of the youngest, strange as it seems to us, is still found here and there in Europe and Asia. It is a reasonable law of inheritance of the settlers in a new country, where there is yet plenty of land to be had for the taking, and the sons as they grow up and marry go out and found new homesteads

of their own. But the youngest stays at home and takes care of the old father and mother; he is, as the Mongols say, the 'fire-keeper,' and at their death he naturally succeeds to the family home. This is one of the hundreds of cases of customs which seem arbitrary and unreasonable, because they have lost their sense by lasting on from the state of life to which they properly belonged."

BOROV'IOHI, a town of Russia, the head of a district in the Novgorod government, is situated on the river Msta. It contains several churches, a monastery, and an hospital. It has a trade in linen, leather, and wood. It has long been famous for the skill of its pilots. Population, 10,000.

BOROV'SK or **BOROF'SK**, a town of Russia in the government of Kaluga, is situated on the Protva. Its trade includes grain, hemp, and cloth. The monastery of Paphnutius, founded in 1114, lies a short distance from the town. Population, 9000.

BORROME'AN ISLES. See LAGO MAGGIORI.

BORROME'O, ST. CARLO, son of Gilberto Borromeo, count of Arona, and of Margherita de' Medici, sister to Pope Pius IV., was born in October, 1538. He studied at Pavia, and took his doctor's degree at twenty-two years of age. Shortly after, his uncle Pius IV. made him a cardinal and archbishop of Milan. Borromeo established an academy in the Vatican for the promotion of learning, and he published its conferences, under the name of "Noctes Vaticanæ." He urged the pope to hasten the termination of the Council of Trent; and upon its conclusion in 1563 he drew up an exposition of the doctrine of the Roman Catholic Church, as sanctioned by that council. This exposition is known by the name of "Catechismus Tridentinus." He was also one of the delegates appointed to reform or to amend the music of the church service. After the death of Pius IV., in 1565, Cardinal Borromeo went to his diocese. He enforced a reform in the clergy, especially among the monastic orders. He visited every part of his diocese, reforming abuses, examining the conduct of his clergy, and providing for the wants of the poor. He established colleges and schools, and asylums for destitute children. When the plague broke out at Milan in 1576, he exerted himself, at the risk of his life, in assisting the sick and relieving the wants of the population in that calamitous time. In some particulars Cardinal Borromeo shared the errors and prejudices of his age, for we find that he believed in the existence of sorcery. His conduct, however, was exemplary, and his zeal for the flock committed to his care unremitting. He died the 3rd of November, 1584. Carlo Borromeo was canonized by Pope Paul V. in 1610. His works were published at Milan in 1747, in five vols. folio. His body, splendidly robed, inclosed in a coffin of rock crystal, is still shown in the crypt of the Cathedral of Milan.

BORROWDALE, a village in the county of Cumberland, near Keswick, in a vale of great romantic beauty. The vale is traversed by the river Derwent, which at the lower extremity winds between high cliffs round the base of the lofty isolated rock called Castle Crag, and enters Derwentwater Lake near the village of Grange. Three hamlets are situated in the vale—Rosthwaite, near the centre; Stonethwaite, in a S.E. branch; and Seathwaite, at the upper or S.W. extremity; and three passes lead from it into the adjoining valleys, which radiate from the high central space between Great Gable and Scawfell Pike. These are Seatoller, W. into Buttermere; Styhead, S.W. into Wastdale; and the Stake, S.E. into Langdale. Sprinkling Fell, over Sprinkling Tarn, to the S. of Styhead Pass, about 1½ mile from Seathwaite, has the largest rainfall in England. The rain-gauge on Sprinkling Fell is 948 feet above the sea level, and 580 feet above Seathwaite; the mean annual fall, 163 inches. On the north side of the vale, near Seathwaite, is the famous mine from which the purest black-lead (or plumbago) in the world was obtained, but

which is now worked out. The mineral is here subordinate to the rock called the "green slate and porphyry," or Helvellyn slate, the middle group of the Cambrian rocks.

BORROWED DAYS. These are the three last days of March, which are proverbially stormy. The popular jingle runs—

"March borrows of April
Three days, and they are ill;
April returns them back again
Three days, and they are rain."

One would rather think, therefore, that the *borrowed days* should be the first days of April, borrowed by March to extend his lease of power; but the opposite is proved by many old writers, and it is undoubted that the last days of March are meant. The Scotch popular rhyme of the "Three Silly Hogs" is well known (hogs being sheep in their second year):—

"March said to Aperill,
I see three hogs upon a hill;
But lend your first three days to me,
And I'll be bound to gar them dee (die).
The first, it sall be wind and weet,
The next, it sall be snaw and sleet,
The third it sall be sic a freeze
Sall gar the birds stick to the trees.
But when the borrowed days were gane
The three silly hogs came hirplin hame."

The country superstition against borrowing or lending on these days probably comes from a misinterpretation of the meaning of the word. (See Brand's "Popular Antiquities.") In 1639, when Montrose marched into Aberdeen, on 30th March, public thanksgiving was made that so clear a dispensation of Providence as a fine "borrowed day" should have been given to the good cause.

BORROWING. This term, though in familiar and general use, has by lawyers been found somewhat hard to define. The definition usually accepted is that laid down by Lord Chief Justice Holt, who described it as borrowing if a thing *lent*, in contradistinction to a thing *deposited* for the use of the owner. It is also implied that the property that is lent must be *specifically* returned at the end of the period agreed upon, or when required by the owner if no special time has been indicated. Where any chattel is gratuitously lent for use, the borrower is not responsible for reasonable wear and tear; but he is responsible for any misuse, for gross want of skill in the use thereof, and for negligence by which injury is caused. On the other hand, should there be any defect in the chattel lent, and the owner be aware of it, it is his duty to acquaint the borrower; and if he fails to do this, and the borrower receives any injury from the defect, the lender becomes responsible to him. A thing borrowed must not be lent again by the borrower without the consent of the owner. A person borrowing a horse or carriage is liable for any damage occasioned by negligent driving or mismanagement, whether done by himself or his servant. Should it be damaged by a stranger, the borrower may maintain an action for the recovery of damages, and this rule applies to the case of any other description of property.

BORROWSTOUNESS or **BONESS**, a seaport in the county of Linlithgow, and one of the oldest in Scotland, stands on a low tongue of land in the Frith of Forth, 24 miles N.W. of Edinburgh. The port is formed by two piers, and has 16 to 20 feet water at spring-tides. There is a trade in coals from extensive mines in the neighbourhood, which extend under the bed of the Forth, almost meeting those of Culross on the other side. Iron, limestone, and freestone abound in the district. The population in 1881 was 4471, an increase of 1190 from 1871. Graham's Dyke (the Roman Wall of Antoninus) passes through the borough.

BOS'CASTLE, a small town on the N.W. coast of Cornwall, near Tintagel Head, 282 miles from London and 20 miles from the Launceston railway station. It is a poor

little place, but in a very romantic situation. The castle from which it takes its name is a circular grass-grown mound, of which only the slightest traces now remain, situated at the point in Dun Street called "Jordan" (i.e. the upper fort), where the two Boscastle valleys meet, overlooked by surrounding hills. There is extreme difficulty in navigating the entrance to the small harbour.

BOSCAWEN, EDWARD, second son of Hugh, viscount Falmouth, was born 19th August, 1711. He was placed in the navy early in youth, and in 1741, under Admiral Vernon, he distinguished himself at the taking of Puerto Bello, on the Isthmus of Darien. On the death of Lord Beaulieu, in the attack upon Boca Chica, Boscawen succeeded to the command of the *Prince Frederick*, of seventy guns. After the declaration of war with France he took the command of the *Dreadnought*, captured in April, 1744, the French ship *Medi*, and landed at Spithead with 800 prisoners. As captain of the *Namur* (seventy-four guns) he also signalized himself under Admirals Anson and Warren, in the engagement off Cape Finisterre. He was made in the same year rear-admiral of the blue, and commander-in-chief of the sea and land forces appointed for the war in India. He sailed in November, 1744, from St. Helena with six ships of the line, five frigates, and 2000 soldiers, and in 1748 obtained possession of Madras, which, in consequence of the declaration of peace, was delivered up to him by the French. In 1750 he returned to England, was promoted, and in the following year became a lord of the Admiralty, and representative for Truro. In 1755 he and Admiral Mostyn were sent to intercept a French squadron bound to America with supplies. Off Newfoundland he fell in with and captured two 74-gun ships and 1500 prisoners, for which he received the thanks of the House of Commons. In 1758, in conjunction with General Amherst and General Wolfe, he took the islands of Cape Breton and St. John. In the following year he obtained a signal victory over the French in the Bay of Lagos, for which, on his return to England, he again received the thanks of Parliament, with a pension of £3000 a year. At this time he received also the additional appointment of general of the marines. He was at sea again in 1760, but he died on 10th January, 1761, at his residence near Guildford, at the age of fifty.

BOS'COBEL, an extra-parochial district of the hundred of Shifnal, Shropshire, lying on the borders of Staffordshire. In this district stands *Boscobel House*, noted as the refuge of Charles II. after the fatal battle of Worcester (1651). The house was at that time occupied by a farmer named Penderell, who faithfully protected him.

BOS'HAM, 3 miles W. from Chichester, in the county of Sussex, and 73 from London by the South Coast Railway, a village of some importance, stands at the head of a creek of Chichester harbour, and is chiefly inhabited by fishermen. The venerable church, situated on a rising-ground, has a fine Saxon tower and Early English nave and chancel. Harold II., the last of the Saxon kings, had a residence at Bosham, the site of which is still pointed out as a considerable piece of ground encircled by a moat. Canute's daughter was buried in Bosham Church, and it is probable that if the story of Canute's lecturing his courtiers on the sea-shore be true, the incident took place here rather than at Southampton. This was the first place upon the Sussex coast in which Christianity was taught; for when Wilfrid landed at Selsey, about the year 680, he found a poor monastery already existing at Bosham. It was from this place that Harold started when he visited Normandy, and Bosham Church makes a conspicuous feature near the commencement of the **BAYEUX TAPESTRY**. The population in 1881 was 1255.

BOS'JESMAN'S, BOSCH'MAN'S, or BUSHMAN'S COUNTRY, a region in South Africa situated to the N. of the colony of the Cape of Good Hope. The inhabitants

are a small and wild race, and in the structure of their pelvis present a peculiarly near approach to that of the gorilla.

BOSNA-SERAI, the capital of the Turkish eyalet of Bosnia, is built upon the ruins of the ancient Tiberiopolis, in 43° 54' N. lat., 18° 26' E. lon. It stands on the Migliazza, which falls into the Bosna not far from the town, and has a massive strong bridge across it. The citadel is at some distance east of the town. Bosna-Serai contains numerous mosques, one serai or palace (erected by Mahmoud II.), four Christian churches, three monasteries, several schools, baths, and charitable institutions, and two large bazaars, and has a population of 60,000. The town is well built, though most of the houses are of wood, and has a gay appearance from the number of minarets which embellish it. Arms, copper utensils, iron-ware, woollen and worsted stuffs, cottons, shoe and morocco leather, are the chief manufactures. Bosna-Serai, being the mart for the whole province, has considerable trade.

BOSNIA or **BOSNEA**, one of the eyalets or provinces of Turkey in Europe, but occupied by Austria since 1878 in virtue of the treaty of Berlin, derives its name from the river Bosna, which runs through the middle of it. It extends from 42° 30' to 45° 15' N. lat., and from 15° 40' to 21° 2' E. lon. It is formed of various portions of Bosnia proper, Turkish Croatia, Servia, and Herzegovina, which were combined in 1824. It comprises an area of about 24,024 square miles, and is bounded by Slavonia, Servia, Albania, Dalmatia, and Croatia.

Bosnia is a mountainous country, and contains many deep valleys, but only one plain of any considerable extent. The mountains are branches of the Dinaric and Julian Alps, which enter it on the side of Austria, and traverse it from N.W. to S.E., exhibiting many peaks 5000 or 6000 feet in height. Three offshoots from the main range traverse the country at right angles. The principal rivers are the Save, the Unna, the Sanna, the Verbas, the Veliki, the Ugar, the Verbanya, the Pliva, the Bosna, the Migliazza, the Szabina, the Sprezza, the Misna, the Foinicza, the Lepernicza, the Drinna, the Tara, the Pima, the Linus. Of these the Save is by far the most important.

The climate is mild and temperate, though the country is liable in the spring to heavy falls of snow, which lie on the lowlands for many weeks. In summer heavy falls of rain and burstings of water-spouts are of common occurrence, but they are highly beneficial in moderating the heat. The soil is in general rocky and stony, and the fertile districts are of but small extent. Wheat, barley, rye, maize, pease, beans, flax, and tobacco are cultivated on a few spots. Fruits are very abundant. The highlands and mountains of Bosnia are so densely covered with forests as in many parts to form impenetrable wildernesses; the trees of which they are principally composed are the oak, beech, pine, fir, and lime—hence the country produces and exports timber for all purposes, whether for building or fuel, and much pitch, tar, and potash. Zvonik is the great mart for dealers in timber, who despatch large quantities from that spot to Zemlin and other parts of Turkey by water carriage along the Drinna, Save, Danube, &c. The country abounds in deer, boars, bears, wolves, lynxes, and foxes. Among domestic animals, horses, cattle, buffaloes, sheep, goats, swine, and poultry are reared; the cattle and sheep are important articles of commerce. Wax and honey are produced.

Gold, silver, iron, quicksilver, lead, and coal are known to exist in many districts; some of the mines are indeed rich, but are poorly worked. Among the articles manufactured are leather, coarse woollens, worsted coverlets, cannon-balls, saltpetre, gunpowder, iron-ware, and weapons, but the extent of the manufactures is very limited.

The exports of Bosnia comprise wool, honey, wax, goats' hair, hides, morocco and other leather, timber and other articles of wood, worsted coverlets, &c., horses, horned

cattle, sheep, goats, swine, poultry, dried fish, pitch, and other domestic produce; and the imports consist of linens, woollens, silks, cotton goods, glass ware, flax, steel-ware, tin, lead, copper, and iron-ware, indigo, colonial produce, &c. Bosnia carries on a considerable transit trade with the adjacent countries in Levant produce, and some roads have recently been made, but they are not very good. The trade of the country would doubtless very much increase if it could have free access to the markets of Europe through the port of Klek (one of the best natural harbours in the world), on the Adriatic; but this Austria has always energetically opposed as contrary to her interests.

The population—1,100,000 in 1844—was estimated at 1,300,000 in 1883. The inhabitants of Bosnia are composed of Bosniacks (a race of Slavonian origin), Servians, Croats, Molacks, and Montenegrius, Turks, Armenians, Greeks, and Jews. The majority of the population are of the Greek faith, but the Turks and many of the Bosniacks adhere to Mohammedanism.

The N.W. mountain region of the Balkan peninsula was embraced in the Roman province of Illyria, and suffered many vicissitudes after the division of the empire. Previous to the seventh century the portion of it known as Bosnia was governed by princes of its own, called Bans, who became dependent on Hungary. Conquered afterwards by the Turks, it was annexed to the Ottoman empire in 1522. At the end of the sixteenth century the Turks mastered also the southern portion of Croatia. As early as 1466 the Herzegovina south of Bosnia and Croatia, which had been known as the dukedom of St. Saba under the Venetian rule, also fell into the hands of the advancing Turkish invaders, and after being the battle-field of Christian and Mohammedan for more than two centuries, was finally annexed to the Turkish empire by the treaty of Carlowitz in 1697. These three conquered territories were formed into the Turkish province of Bosnia, the hereditary chiefs being deprived of their prerogatives and of most of the revenues. Since that time the country has been the scene of almost constant disturbances and rebellions by the brave and hardy mountaineers. In no part of the empire was Turkish rule so thoroughly detested as in Bosnia, and the imbecile, grinding, and often persecuting policy of the Turks caused the chronic state of revolt to develop in 1875 into a formidable insurrection, concentrated chiefly in Herzegovina, where it was recognized by the general opinion of Europe that the people had just cause for complaint. The Turkish "begs" of the province, however, who had always forced for themselves a practical autonomy, were equally opposed to being handed over to Austria in virtue of the treaty of Berlin. Hence the difficulty and opposition experienced by Austria in occupying Bosnia in 1878.

BOSPORUS (or, as it is now written, *Bosphorus*), according to mythological traditions, derives its name from the passage of Io over one of the straits so called, when she was turned into a cow. The Bosphorus, as thus explained, literally signifies "the passage of the cow." Two straits are mentioned by Greek and Roman writers under this name. One, now more commonly called the Channel of Constantinople, unites the Propontis, or Sea of Marmara, to the Black Sea. This narrow channel was often called the Thracian Bosphorus, by way of distinction from the other, named the Cimmerian. It was across it that Darius led his army by a bridge of boats against the Scythians. The Cimmerian Bosphorus, now the Straits of Kaffa or Yenikalé, is the narrow passage which connects the Palus Mæotis, or Sea of Azof, with the Black Sea.

A narrow strip of low and fertile land on the S.E. angle of the Taurian Chersonesus (the modern Crimea) formed the ancient kingdom of Bosphorus; it extended about 60 miles, direct distance, from Theodosia, now called Feodosia or Kaffa, on the west to Panticapæum or Bosphorus, now Kertsch, on the Straits of Yenikalé. There

was a series of Greek kings of the Bosphorus from B.C. 430 to B.C. 304. At a later date the Bosphorus formed part of the kingdom of the great Mithridates. This kingdom continued under the Roman emperors, and a race of half-Greek half-barbaric kings continued to possess the Crimea and the neighbouring coasts of the Black Sea at least to the time of the Antonines. The kingdom of Bosphorus survived the Roman empire, and only expired under the ravages of the Huns.

In modern times the name of Bosphorus has been almost exclusively applied to the *Bosphorus Thracicus*, or Strait of Constantinople, which unites the Sea of Marmora with the Black Sea, and forms the boundary between European and Asiatic Turkey. This channel is 16 miles in length, and varies in breadth from 550 yards to 2 miles, with a depth of from 148 to 388 feet. There is a rapid current through the centre from the Black Sea to the Sea of Marmora, and a counter-current along each shore, the three currents producing a violent commotion. The scenery along both shores is very fine.

BOSQUET, PIERRE FRANÇOIS JOSEPH, a distinguished French soldier, was born 8th November, 1810, at Mont de Marsan, in the department of Landes. He was educated at the Polytechnic School at Paris, and entered the army in 1833. In 1834 he went with his regiment to Algeria, where his progress was so rapid that in 1847 he had attained the rank of colonel, and in 1848 was made a general of brigade. In 1853 he returned to France, and was made a general of division by the emperor the following year. He served in the Crimean War with much distinction, especially in the battles of Alma and Inkerman. For his conduct at the latter he received the thanks of the British Parliament. At the taking of the Malakoff he was wounded by the bursting of a shell, and was obliged to return to France. In 1856 he was made field-marshal. He died 14th February, 1861.

BOSSINEY, a small hamlet on the N.W. coast of the county of Cornwall, 274 miles from London and 10 miles from the Bodm Road railway station. It is the reputed birthplace of King Arthur, and to it are the ruins of his celebrated Tintagel Castle; they are on the summit of a large rock which juts into the sea, and which is connected by a narrow isthmus with the mainland. It is said to have been a very strong fortress. The parish of Tintagel, in which it stands, has a population of 891. It returned two members to the House of Commons from the reign of Edward VI. to the great Reform Bill of 1832.

BOSSUET, JACQUES BENIGNE, Bishop of Meaux, one of the most distinguished of the orators and prelates of the church of France, was born at Dijon, 27th September, 1627. He came of an ancient and honorable family, and his father, Benigne Bossuet, was a counselor in the parliament of Metz. Designed for the church from his childhood, Bossuet was sent for education to the Jesuits' College at Dijon, where he displayed great ability, devoting his most constant efforts towards obtaining a knowledge of the Greek and Latin languages, and studying with a keen relish the works of Homer and Virgil. On one occasion, however, he found some leaves of a Bible on his father's desk containing that of the prophecies of Isaiah, which he read, and was so charmed by their force and beauty that he became an ardent student of the Holy Scriptures, which character he sustained until the end of his life. His preceptors the Jesuits, who had discovered the abilities of their pupil, wished to attach him to their order; but as this did not meet the wishes of his family he was sent up to Paris in 1642, where he entered the College of Navarre as a theological student, and where he remained for two years. In 1648 he took his bachelor's degree; and in 1652, after a retreat at the College of St. Lazarus, then under the direction of St. Vincent de Paul, he received priest's orders. The same year he was made a doctor of the Sorbonne, coming second on the list,

the Abbé de Rance, afterwards founder of the order of La Trappe, being first. He was also made archdeacon of Metz, and to this city he went to take up his charge, remaining there six years. During this period he continued his studies in the Scriptures and in the writings of the fathers, especially those of St. Augustine. Here he published the first of those controversial works for which he was afterwards to become so famous, being called upon by his bishop to prepare a reply to the Catechism of the Calvinist pastor Paul Ferri. His fame as a pulpit orator soon spread beyond the limits of Lorraine, and he so attracted the attention of the queen-mother, Anne of Austria, that he was made preacher to the court in 1661. In 1667 Marshal Turenne made to him his abjuration of Protestantism, after reading in manuscript Bossuet's "Exposition de la Doctrine Catholique." In 1669 he was made bishop of Condom; but being also appointed preceptor to the dauphin in 1670, he resigned his bishopric a few months afterwards, finding the necessary attendance at court incompatible with the performance of his episcopal duties. In compensation he received the revenues of the Abbey of St. Lucien, at Beauvais. The learned Huet was appointed sub-preceptor to the prince; and while the latter prepared and published the famous Delphin edition of the Classics, Bossuet composed his "Discours sur l'Histoire Universelle," which he published in 1681. In this work, which is remarkable as being one of the first efforts made towards a philosophical treatment of history, he endeavoured to show that in the history of the Bible, and that of the ancient world, and in Christian history up to the time of Charlemagne, a divine providence must be seen working for the coming of the Catholic Church. He remained at court about ten years, and though but little sympathy seems to have existed between himself and his royal pupil, he exercised considerable influence in the court itself, and enjoyed frequent intercourse with the greatest intellects of France at that period. In 1671 he was made a member of the Academy of France, and the same year published the most celebrated of his polemical works, the "Exposition de la Doctrine de l'Eglise Catholique sur les Matières de Controverse." In 1678 occurred his famous controversy with Claude, the learned Protestant pastor of Charenton. This took the form of a personal discussion lasting five hours, the subject being the authority of the church. Great ability was displayed by each of the controversialists, and both parties claimed the victory. Each disputant published an account of the debate, but they differ from each other on many points. At the end of 1679 his position as preceptor came to an end, and in 1681 he was made bishop of Meaux, which office he retained until the end of his life. During this year he was called upon to attend the council of French clergy which had been summoned by the king to consider the question of the *régale*, or the royal right to administer the affairs of a vacant see, and also on the general questions of the relation of the spiritual to the temporal power, and of the papacy to the church. Bossuet was chosen to preach the opening sermon, which he delivered on the 9th November, 1681, expressing very strongly his opposition to the overbearing disposition of the papacy. The line of conduct which he there indicated he succeeded, by almost incredible labour and patience, and the full exercise of all his matchless powers, in inducing the assembly to pursue, and the result was the famous declaration of the Gallican Church, dated 19th March, 1682, contained in four articles drawn up by himself, and agreed to by the whole council of French clergy. The important points of this declaration are—(1) the assertion of the radical distinction between the spiritual and temporal powers; (2) of the independence of the latter on the former; (3) that in conformity with the Council of Constance the decision of a general council is superior to that of the pope; (4) that the decision of the pope is not unalterable, and that the

usage of individual churches should be recognized by the papacy. This declaration was fiercely assailed, and was defended by Bossuet in his "Défense de la Doctrine du Clergé de France," but which was not published until after his death.

On the breaking up of the assembly in June, 1682, Bossuet immediately proceeded to Meaux, where for the next twenty-two years he laboured with unremitting zeal for the benefit of his diocese. He bestowed the most careful attention upon the seminary for the clergy, held a diocesan synod once a year, and frequent clerical conferences in different parts of his diocese. He preached regularly on Sundays and holidays in his cathedral, and wrote over 700 letters of advice and direction on religious matters to nuns and other persons seeking his counsel. In 1688 he published his celebrated "Histoire des Variations des Eglises Protestantes," and responded to the replies made to it in smaller works published in 1689 and 1691. In 1694 he commenced a controversy with Fénelon which lasted five years, in which unhappily he was led to display great bitterness, and in his anger to act in an unjust manner towards his opponent. He afterwards sought to effect a reconciliation with Fénelon, but his plans were never carried out. During the close of his career he was afflicted with stone, which caused his death on the night between the 11th and 12th April, 1704. During his last illness he suffered prolonged and intense pain, which he bore with wonderful patience and resignation. He was buried in the Cathedral of Meaux, where his remains still rest. An earnest and devoted bishop of the church, and eminent alike as a theologian and a controversialist, it is perhaps upon his conduct in connection with the declaration of the Gallican Church, and upon his power as an orator, that his fame chiefly rests. As an orator Bossuet stands in the first rank of great preachers, and in many respects without a rival. Among French pulpit orators Fontenelle is regarded as having surpassed him in lucidity of arrangement and correctness of style, and Massillon in the musical flow of his periods; but in comprehensiveness of view and grandeur of conception Bossuet towers far above them, and his enthusiastic eloquence, sustained by his wide learning and great power of thought, and springing from deep personal conviction, has perhaps never been equalled since. His works have been frequently published, the most complete edition being that which was issued under the direction of the Benedictines, in forty-six vols. (Versailles, 1815-19). To this edition is appended a valuable memoir by Cardinal Bausset. See also "Bossuet and his Contemporaries" (London, 1875).

BOS'TANJİ (from *bostan*, a garden) are a class of men who now perform a variety of functions, and whose head or chief (*bostanji-bashi*) is one of the grand dignitaries of the Turkish empire, but who seem originally to have been nothing more than the sultan's gardeners. They still work as gardeners in the sultan's pleasure-grounds, but the more conspicuous of their duties are to mount guard in the seraglio, to row the sultan's barge, to row the caiques of all the officers of the palace, to follow those great men, on foot, when they ride on business through the city, and to attend to the execution of the numerous orders of the *bostanji-bashi*. The *bostanji-bashi* has the rank of a pasha, is governor of the seraglio and the other imperial residences, inspector-general of the woods and forests in the neighbourhood of Constantinople, and attends the sultan whenever he makes an excursion by water. He used also to exercise the functions of provost-master-general, presiding at the bow-stringing of the Turkish grandees when the execution took place within the walls of the seraglio; but of late years the more horrible functions of the *bostanji-bashi* have been considerably abridged.

BOS'TON, a harbour and municipal and parliamentary borough in Lincolnshire, near the mouth of the Witham,

and about 30 miles S.E. of Lincoln. It is 116 miles N. from London by road, and 107 by the Great Northern Railway.

The town is supposed by some, from antiquities found in its neighbourhood, to have been a Roman station, and to have taken its name (St. Botolph's Town) from a monastery built by St. Botolph, A.D. 654, at Ikenhoe, destroyed by the Danes in 870. It was a wealthy town in the year 1204; for when the *quinziesme* was levied (a duty which was raised on the fifteenth part of land and goods at the several ports of England) the merchants of Boston paid £780, and London paid £836 (Madox's "Hist. of the Exchequer"). London paid the largest sum of any port, and Boston was the second in amount.

The advantages which Boston possessed as a seaport and place of trade brought over the merchants of the Hanseatic League, who established their guild here. In 1359 Edward III. assessed eighty-two towns to provide ships and men for the invasion of Brittany. Boston furnished to this navy seventeen ships and 361 men, a greater number of vessels than was supplied by Portsmouth, Hull, Harwich, or Lynn. About 1470, in consequence of some dispute, the Hanseatic merchants quitted Boston, and the trade of the place immediately began to decline. There were several monasteries and other religious establishments in Boston, which was consequently still further reduced by the dissolution of the monasteries by Henry VIII. Some amends were made by Henry in granting the town a charter of incorporation. During the reign of Elizabeth the port continued to decline, though she granted the mayor and burgesses a charter of admiralty, giving them power to levy certain duties on ships entering the "Norman Deep." In 1613 Boston was strongly fortified, and became the headquarters of Cromwell's army; but Colonel Cayendish having defeated the Parliamentary troops at Denington, near Boston, Cromwell was compelled to remove to Shaford. About the middle of the eighteenth century the commerce of Boston fell into still greater decay, "through the ruinous state into which the river and haven had fallen" (Thompson). In 1729 a ship of 250 tons could get up to Boston, but in 1750 even a small sloop of 40 or 50 tons could not sail out from the town except at a spring tide. One of the causes of this decay of the harbour was created by the diversion of the waters of the neighbouring fens from their ancient entrance into the Witham above Boston, which assisted in securing away the sediment brought up by every tide. An Act of Parliament was obtained in 1762 empowering the corporation to cut a canal, and to construct a great sluice, which was opened in 1766. Various subsequent Acts of Parliament for draining, deepening, and embanking were obtained, and such favourable results have followed that ships of 300 tons burden can now reach the heart of the town. The entrance dock is 300 feet long and 50 feet wide, and the depth at ordinary spring tides is 25 feet. The dock itself has an area of 7 acres. A new dock was built in 1883. The number of vessels registered as belonging to the port in 1880 was 65 (3500 tons). The entrances and clearances each average 400 (27,000 tons). The customs revenue is about £30,000 per annum. The foreign commerce is chiefly confined to the importation from the Baltic of timber, hemp, tar, pitch, and iron. The coasting trade is mainly in the export of corn, wool, and other agricultural produce, the return cargoes consisting of coal and manufactured and colonial goods.

Boston is situated on both sides of the river Witham, in the centre of a very fertile agricultural district, equally adapted to pasturage and corn. Very large numbers of sheep and horned cattle are sold at the markets, and the drainage and inclosure of the neighbouring fens have also enabled the inhabitants to bring to the markets large quantities of agricultural produce. The town also has manufactures of sailcloth, canvas, sackings, ropes, leather, bricks, and whitening, and some iron and brass foundries.

By means of the Great Northern Railway, and the Witham and canals connected with it, Boston has communication with Lincoln, Gainsborough, Nottingham, and Derby, and by them with various other inland towns.

Boston is well built, clean, and contains many good dwelling-houses and shops, and extensive granaries and warehouses. The market-house includes a convenient corn market, with assembly-rooms above. The town also contains a custom house, a union, dispensary, three subscription libraries, a Freemason's hall in modified Egyptian style, atheneum, a public promenade at Vauxhall Gardens, and a theatre. The Witham is crossed by an iron bridge, built by Rennie, of a single arch 86½ feet span. A view of this bridge will be found in Plate II., Bridge.

The first stone of the fine Church of St. Botolph was laid in 1309. It is one of the largest parish churches in the kingdom, and its tower one of the loftiest, being 300 feet high. The latter is visible at sea for more than 40 miles, and its elegant octagonal lantern is a guide to mariners entering the Boston and Lynn Deep. It is a fine composition of the Perpendicular style. A chapel attached to the church was restored in 1857, under the superintendence of Sir G. G. Scott, as a memorial to the Rev. John Cotton, who was vicar from 1612 to 1633, when he proceeded with many of his parishioners to America, and became pastor of Boston, in Massachusetts—the town being named after that which they had left at home. The expense of the restoration of part of his old church was borne by Americans. There are places of worship for all denominations of Dissenters. A grammar-school was founded by a grant in 1551, and there are several other schools and charitable institutions. The town is well supplied with good water.

Boston is divided into two wards, and has a mayor, six aldermen, and eighteen common councilmen. The number of inhabitants in the municipal borough and parish in 1881 was 149,937. As a parliamentary borough Boston returned two members to the House of Commons from the reign of Henry VIII., but it was deprived of one by the Redistribution Bill of 1885. Foxe, the martyrologist, was a native of Boston.

BOSTON, a very important commercial city of the United States, capital of Massachusetts, is situated at the W. extremity of Massachusetts Bay, 236 miles N.E. of New York. The city consists of three parts—Boston Proper, East Boston, and South Boston. It also includes the towns of Roxbury, Brighton, and Charlestown, from the latter of which it is separated only by the Charles River. Boston Proper, or Old Boston, occupies a peninsula embracing about 700 acres; the surface is very uneven, and in three places rises into hills of considerable elevation, the highest being 138 feet above the level of the sea. A narrow isthmus, or "neck," as it is called, a little more than a mile in length, joins the peninsula to the mainland of Roxbury on the S. This neck, once overflowed by the tides, was the only passage to the city till the year 1786; and by fortifying it in the early part of the American Revolution, the British were enabled to cut off all intercourse between Boston and the surrounding country. It has since been raised and made much wider, so that at present there are four avenues leading over it from Roxbury to Boston. Besides these thoroughfares, seven very long bridges connect Boston Proper with Charlestown, South Boston, Cambridgeport, and East Cambridge. There is also the Western Avenue, about 1½ mile long, and from 60 to 100 feet wide; this avenue is built upon a substantial dam, which is constructed across the bay, inclosing an area of from 600 to 700 acres. It has been filled up to an average height of 18 feet from the water level with gravel. It is handsomely laid out in wide streets, and contains some of the finest dwellings and public buildings in Boston. This portion of the city is known as the "Black Bay Lands."

South Boston extends about 2 miles along the south

side of the harbour, between Boston Proper and Fort Independence. It embraces about 600 acres of varied surface, and is handsomely laid out; many of the streets intersect each other at right angles, and form squares. Near the centre, and about 2 miles from the State house, are the famous Dorchester Heights, by the fortification of which in the Revolutionary War the Americans succeeded in expelling the British from Boston. These heights afford a magnificent view of the city, bay, and surrounding country.

East Boston occupies the western part of what was formerly known as Noddle's Island, and embraces about 660 acres. The surface is very uneven, portions of it rising into considerable elevations, which afford fine sites for dwellings. The island is situated at nearly the same distance from Boston Proper as from Charlestown.

The streets of Boston were originally laid out upon no systematic plan, and being accommodated to the unevenness of the surface, many of them were crooked and narrow; but these defects have of late been remedied to a considerable extent, so that the principal thoroughfares are now convenient and spacious. A terrible fire broke out in the city on 4th November, 1872, which destroyed almost all the trading portion of the town, consuming 939 buildings and property to the value of £14,000,000. The part destroyed was, however, rebuilt in a more handsome and commodious manner than before. Advantage was taken of the opportunity to widen several streets.

Among the public buildings, the State House, from its position, is the most conspicuous. It stands on the summit of Beacon Hill, and is 173 feet long, 61 feet wide, with a dome 50 feet in diameter. The view which is afforded from the cupola is unsurpassed by anything in the United States. On the entrance-floor stands a fine statue of Washington, by Chantrey. Faneuil Hall, the "cradle of liberty," as it is called, is an object of much interest, as being the place where the orators in the days of Hancock and Adams roused the people to resistance against British oppression. The Custom House is built of granite, in the form of a cross, and surmounted by a dome. The foundations rest upon 3000 piles. The Merchants' Exchange is a fine building. The front is composed of Quincy granite, with four pilasters, each a single stone 45 feet high, and weighing about 55 tons. In the basement is the city Post Office. The City-hall is of light-coloured granite, and in front of it is a statue of Franklin. The music-hall is one of the finest in the United States. It contains a magnificent organ, which was built in Ludwigslust, Germany, and cost 60,000 dollars. It has 89 stops, and nearly 6000 pipes. There are in the city about 100 churches of various denominations, and a park (the Common), one of the finest in America.

Boston, as the centre—social, political, and commercial—of the best-educated and most intelligent state in the Union, is pre-eminent throughout America in literature and science. The Boston Athenaeum, incorporated in 1807, has become one of the most richly endowed and splendid literary institutions in the States. In addition to a very valuable library, it contains a fine gallery of sculpture, and also one of paintings. The Massachusetts Historical Society, organized in 1794, possesses a library of 12,000 volumes, together with an extensive collection of pamphlets, maps, charts, coins, and other relics. The Boston Library Society, founded in 1794, has a hall and a library of about 20,000 volumes. The American Academy of Arts and Sciences has a library of 15,000 volumes. Excepting the American Philosophical Society, at Philadelphia, this is the oldest organization of the kind in the United States, having been founded in 1780. There is also a handsome public library of 300,000 volumes, free to every citizen. Among the other institutions may be mentioned the Society of Natural History, and also the Institute of Technology.

The Medical College connected with Harvard University is situated in Boston. At the Lowell Institute regular courses of free lectures are given upon all important subjects. There are also many other similar societies. There are issued in Boston about 100 newspapers and periodical publications, treating of almost every subject, whether of news, art, literature, or science, the city being regarded as the most literary in the United States.

Closely identified with the history of Boston is her system of public instruction. Her schools have long been ornaments to the city, and the pride of New England. As early as 1635 the town records bear evidence to the establishment of a "free school," and from that hour to the present nothing has received more earnest attention than the subject of education. The system comprises three grades, primary, grammar, and high schools. HARVARD UNIVERSITY is in Cambridge, about 3 miles from the city.

Boston has a municipal government, consisting of a mayor, eight aldermen, and forty-eight councillors. The benevolent institutions of Boston are numerous and well-endowed, and include the Massachusetts General Hospital, a handsome granite building, surrounded with pleasure-grounds 4 acres in extent.

In commercial importance, Boston ranks among the first cities of America. Her foreign commerce has always been great, and extends to almost every nation on the globe. Her coast trade is also very extensive. The harbour opens to the sea between two points nearly 4 miles distant from each other. It is sheltered from the ocean by the peninsula of which these two points are the extremities, and a large number of islands, between which are three entrances—so that whether for defence or trade the haven is one of the finest in the world. The main passage, which is so narrow as scarcely to admit two vessels to pass abreast, lies between Castle and Governor's Islands, and is very strongly fortified. The entire surface included between the two points at the mouth of the harbour is estimated at 75 square miles, about half of which affords good anchorage ground for vessels of the largest class. It is easy of access, and seldom obstructed with ice. The imports consist of flour, grain, cotton, staves, equal tobacco, and rice, from nearly all the states of the Union, and of most kinds of European manufactures, wines, brandies, East and West Indian produce, from abroad. The chief exports are corn, pork, lard, salted fish, ice, lead, petroleum, sperm-oil, and manufactured goods, as woollens, cotton, paper, boots and shoes, cordage, hardware, and furniture, in the production of which Massachusetts excels all the other states. The port is the chief seat of the American trade in ice, which has now attained enormous proportions. It is mostly called "Wenham Lake," which is 20 miles N.N.E. of the city. Several great lines of railway terminate in Boston, affording it ample means of communication with Canada and all parts of the United States.

The peninsula upon which Boston is built was known to the Indians as *Shawmut*, or "living fountains," and from the peculiar conformation of its surface the first settlers gave their settlement the name of Tremont, or Trimountain, from the three hills on which it stood. It was founded in 1630, and named Boston from the town in England described in the previous article, whence many of its inhabitants had emigrated. Throughout the whole period of its history its inhabitants have displayed great energy in asserting popular rights. The American Revolution commenced at Boston—some cargoes of taxed tea consigned to the port by the East India Company having been emptied into the sea. In 1775 the British army, to the number of 10,000, had possession of the place, which was blockaded by the Americans. The battle of Bunker's Hill was fought near it in June, 1775, and the Americans were compelled to withdraw. The town was soon afterwards again invested

by General Washington, who, having intrenched himself on the Heights of Dorchester, which commanded it, compelled the British troops to evacuate it. Washington thereupon entered it on the 17th March, 1776. Benjamin Franklin was born here in 1706.

The population of Boston was 24,937 in 1800; 93,383 in 1840; 177,810 in 1860; 250,526 in 1870; and 362,839 in 1880.

BOSWELL, JAMES, chiefly known as the biographer of Dr. Johnson, was born at Edinburgh in 1710. His father was Alexander Boswell, Esq., of Auchinleck (pronounced Asleek), in Ayrshire, who, being in 1754 made a lord of session, assumed the title of Lord Auchinleck. After having studied law at the Universities of Edinburgh and Glasgow, James Boswell visited London for the first time in 1760, and again in 1763, when he was introduced to Dr. Johnson, then at the height of his fame.

In 1773 he accompanied Johnson on his journey to the Western Islands of Scotland, and in 1785 he published the first and not the least remarkable sample of his *Johnsoniana*, in a "Journal" of the tour to the Hebrides.

In 1790 appeared, in two volumes 4to, the work which has preserved his name, and made it universally known—his "Life of Johnson." The sensation excited by this extraordinary production was very great; and if it be always an evidence of superior talent to do anything whatever better than it has ever been done before, the work undoubtedly deserved all the immediate success it met with, and the celebrity it has ever since enjoyed; for, whatever may be thought of the character of either the intellectual or the moral qualities of the writer, it cannot be disputed that the same qualities had never before been half so skillfully or felicitously exerted. Nor has any work of the same kind since appeared that can be compared with Boswell's; as Macaulay says, "Boswell is the first of biographers. He has no second." The curious anomaly is presented of a man as nearly a nonentity as a man can be, writing one of the most entertaining and valuable books in literature. His vanity is only equalled by his folly; and he never knows when he is making a fool of himself. For instance, having visited Corsica, he proclaimed the fact by a ribbon round his hat, "Corsica Boswell." A hundred such things may be said of Boswell with truth. But all is forgiven by the grateful reader of the man who has left us the miniature portrait of great Samuel Johnson. Not having sense to select, he has fortunately given us all he knew. He was preparing a second edition of his "Life of Johnson" at the time of his death, 19th May, 1795.

BOSWELLIA is a genus of trees which produce valuable gum resins. [See OLIVASTRA.] There are three or four species, natives of tropical North Africa and Central India. The calyx is five-toothed, free from the ovary; there are five petals and ten stamens. The fruit is three-cornered, with three valves. This genus belongs to the order BURSIFLORÆ.

BOSWORTH (commonly called *Market Bosworth*), a market-town in Leicestershire, is situated on an eminence, 93 miles from London, being a mile from the Welford station of the London and North-western line. The decisive battle between Richard III. and the Earl of Richmond, when the death of the former, after a bloody struggle of two hours' duration, terminated the long strife between the houses of York and Lancaster, was fought 22nd August, 1485, on a plain about a mile south of Bosworth. On an eminence called Crown Hill, Lord Stanley placed the crown upon the head of the victor, Henry VII. The town has a well-endowed grammar school, in which Salf the Abyssinian traveller, and Dives the Greek critic were educated, and in which Dr. Johnson was at one time an usher. The chief manufacture is of worsted articles. The population in 1881 was 3978.

BOTANY is the science which treats of the vegetable kingdom—the structure and forms of plants; their food, and how this nourishes them; the conditions and laws of their life, growth, and reproduction; their varying degrees of relationship, the occurrence of fossil plants, the distribution of plants, and their uses to man.

The science of Botany thus consists of various departments. 1. **MORPHOLOGY** treats of the various forms of cells (the elementary constituents of plants), their composition, formation, contents, and combination into tissues; it discusses tissues in the same way; and finally, examines the forms of plants, of stems, leaves, and their other members. 2. **PHYSIOLOGY** treats of the life and growth of plants, and the functions of their various organs. 3. **CLASSIFICATION** aims at the construction of a scheme of affinities. 4. **DISTRIBUTION**, or *Geographical Botany*, shows where the different kinds are found on the surface of the globe, and attempts to account for peculiarities of position. 5. **PALÆONTOLOGY** compares fossil with living plants, in order to be able to form true notions of their morphology, and also teaches what kinds were in existence at successive geological periods.

In **MEDICAL** and **ECONOMIC BOTANY**, the value of various plants in medicine and the arts is considered; while the cultivation of those which afford useful products is treated of in **AGRICULTURE**, **ARBORICULTURE**, and **HORTICULTURE**.

The earliest evidence that we possess of the real state of botanical knowledge is afforded by the remains of the writings of Aristotle and his school. It is by this school that botany must be considered to have been first formed into a science. As Aristotle, in all probability, was its founder; so it is chiefly from the remarks upon plants scattered through his books concerning animals, that his knowledge of vegetable physiology was, for a city, of a most remarkable kind. His two books *Περὶ Φυτῶν* are universally acknowledged to be spurious, though he certainly proposed to himself to write a treatise on the physiology of plants. Aristotle's pupil and successor, Theophrastus, wrote a "History of Plants" in nine books, and also a work "On the Causes of Plants." When he succeeded to the chair of Aristotle (near 324) no treatises to have existed of classification, nor indeed was its necessity by any means apparent, for Theophrastus does not appear to have been acquainted with above 255 plants in all. Theophrastus was careless in his denomination of species, but still he attended accurately to differences in the organs of plants, to some of which he gave new and special names. The form of leaves, their venation, the manner of their indurication, and the nature of the leaf-stalks, especially attracted his attention. He showed that there was no philosophical distinction between herbs, shrubs, and trees, pointed out the great difference between the wood of palms and that of trees with concentric layers, and demonstrated the power possessed by leaves of absorbing nourishment from the air. Dioscorides, a Greek physician who probably lived in the time of Nero, wrote a treatise on *Materia Medica*, but though he speaks of about 600 plants, his descriptions are so vague that nearly 200 still remain undetermined. Both he and Pliney are greatly indebted for their knowledge of plants to Theophrastus. By this time, however, a considerable amount had been made to the stock of botanical knowledge. For example, the sexuality of plants, which Aristotle had noticed, and which Theophrastus had adverted to, is spoken of as positive terms. Grafting and budding are described even by the poets of that time. Under the later Roman emperors science became gradually extinguished. Under the Byzantine princes it can scarcely be said to have been preserved.

On the revival of science in Europe, the writings of the classical and Arabian herbalists were taken as the textbooks of the schools; but their errors were multiplied by

false translations, and their superstitions were admitted without question. Between the time of Ebn Belthar, who flourished in the thirteenth century, and the year 1582, when the "*Herbarum Vivæ Eicones*" of Otto Brunfels, a Bernese physician, was published, scarcely a single addition had been made to the slender stock of knowledge of about 1400 species, which are computed by Sprengel to have formed the total amount discovered by all botanists, Greek, Roman, and Arabian, up to the death of Abdallatif of Bagdad. Brunfels deserves to be mentioned as the first reformer of botany, and as the earliest writer who earnestly endeavoured to purify the corrupted streams which had flowed through so many ages of barbarism from the ancient Greek and Roman fountains. His example was speedily followed by Tragus, Fuchsius, Matthioli, and others. The knowledge of species rapidly augmented, till at last their abundance became so great as to call for the assistance of compilers capable of digesting what had already begun to be scattered through numberless works. The first undertaking of the kind was by Conrad Gesner, a native of Zurich, who died in the year 1565. He introduced one of the most important changes in science by showing the necessity of dividing plants into classes, genera, and species, and that this could only effectually be done by means of distinctions derived from the flower and fruit. About the same period lived Clusius, Turner ("father of English botany"), Dodonæus, Gerard, Lobel, Casalpini, and John and Caspar Bauhin. Gerard's Herbal was published in 1597.

Matthew Lobel, a Dutch physician who resided in England in the time of Elizabeth and James I., struck out a method by which plants could be so arranged that those which are most alike should be placed next to each other. This early attempt at the discovery of a natural system was exceedingly rude and imperfect, but it comprehended several combinations which are recognized at the present day. Cucurbitaceæ, Stellatæ, Gramineæ, Labiatæ, Boraginæ, Leguminosæ, Filices, were all distinctly indicated; and it may be added that under the name of Asphodels he grouped the principal part of modern petaloid monocotyledons. Casalpini applied the conception of Gesner to the arrangement of the vegetable kingdom, and is the first who distinctly mentions the true difference of sexes in plants. Linnaeus says that he was "primus versus systematicus." Caspar Bauhin in 1623 published his "*Pinnæ Theatri Botanici*," which shows at one view the information which had previously been given by a multitude of scattered authors. But notwithstanding the attempts made by a few distinguished men to reduce botany to some general principles, it still continued to languish. At last a change, as sudden as it was important, was produced in the science by the application of the microscope to botanical purposes. About the middle of the seventeenth century this instrument was first employed in the examination of the elementary organs of plants. The discovery of spiral vessels by Henshaw in 1661, and the examination of the cellular tissue by Hook at a somewhat later date, at once excited the attention of observers, and led at nearly the same time to the appearance of two works upon vegetable anatomy. Grew and Malpighi, but more especially the former, combined with rare powers of observation a degree of patience which few men have ever possessed. They each examined the anatomy of vegetation in its minutest details. From Grew physiological botany, properly speaking, took its origin, and he was the first to point out the difference between seeds with one cotyledon and those with two. Grew, however, was no systematicist; and it was reserved for another Englishman to discover the true principles of classification. This was John Ray, a man of a capacious mind, of singular powers of observation, and of extensive learning, who in his "*Historia Plantarum*," the first volume of which appeared in 1686, embodied in one connected series all the facts that had been collected

concerning the structure and functions of plants; to these he added an exposition of what he considered the philosophy of classification, as indicated partly by human reason and partly by experience; and from the whole he deduced a classification which is unquestionably the basis of that which, under the name of the system of Jussieu, is everywhere recognized at the present day. In the memoir of RAY further information will be found, but here it may be observed that he separated flowering from flowerless plants, divided the former into dicotyledons and monocotyledons, and arranged under these three heads a considerable number of groups which are substantially the same as those which at the present day are called "natural orders." Tournefort, who for a long time stood at the head of the French school of botany, proposed, in 1694, a method of arrangement, in its principles entirely artificial, but which in some cases was accidentally in accordance with natural affinities. His system was founded chiefly upon differences in the corolla.

Linnaeus, a man of a different and a higher order, was destined to produce a revolution in botany, among other branches of natural history, which in some respects advanced and in others retarded its progress far more than the acts of any one who had preceded him. He found the phraseology bad, and he improved it; the nomenclature was awkward and inconvenient, and he simplified it; the distinctions of genera and species, however much the former had been improved by Tournefort, were vague and too often empirical, and he defined them with an apparent rigour, which the world thought admirable, but which nature spurned; he found the classifications of his day so vague and uncertain that no two persons were agreed as to their value, and for them he substituted a scheme in which all things seemed as clearly circumscribed by rule and line as the fields in the map of an estate.

Antoine Laurent de Jussieu, in the year 1789, just eleven years after the death of Linnaeus, produced, under the name of "*Genera Plantarum*," an arrangement of plants according to their natural relations. The system of Jussieu gave a death-blow to verbal botany, and laid the foundation of future classifications.

In 1790 the German poet Goethe published a pamphlet called "*The Metamorphosis of Plants*." Linnaeus had thought that the parts of a flower are only modifications of leaves, and the same theory was propounded by Ludwig and Wolf. However, it attracted no attention till the appearance of Goethe's pamphlet. Goethe was aware of the *prolepsis plantarum* of Linnaeus, but was not acquainted with the writings of Ludwig and Wolf. He demonstrated that all those organs to which so many different names are applied, and which, in fact, have so many dissimilar functions to perform, are all modifications of one common type—the leaf.

In 1813 A. P. De Candolle published his "*Theorie Elémentaire de la Botanique*," in which he modified the classification of Jussieu. In 1816 he was appointed to the chair of natural history at Geneva, with the care of the Botanic Garden. He then commenced his great work, "*Prodromus Systematis Naturalis Regni Vegetabilis*," in which he proposed to give descriptions of all known species, arranged according to his method of classification. This work was continued by his son and grandson, Alphonse and Casimir De Candolle, assisted by other eminent botanists, and, with the omission of the Monocotyledons and some orders of Dicotyledons, was completed in 1873. Robert Brown, rightly styled by Humboldt "*botanicorum facile princeps*," made important steps in the development of the natural system by the philosophic foundations which he established for it in his still imperfect "*Prodromus Florae Novae Hollandiae*" (1810). Endlicher's "*Genera Plantarum*," Lindley's "*Vegetable Kingdom*," the works of Bentham and of the two Hookers, of Brogniart, Schimper, Carruthers, and a host of others, have contributed

to the advance of our knowledge of the true affinities of plants, and to the perfecting of the classification.

The Linnean system is founded on the number, situation, and proportion of the essential organs of fructification denominated stamens and pistils. Thus the vegetable kingdom is divided into twenty-four classes, of which twenty-three belong to flowering and one to flowerless plants. They are distinguished by their stamens, and are subdivided into orders, usually known by their pistils. The names of the classes and orders are of Greek derivation, and allude to the functions of the respective organs. The first eleven classes are distinguished entirely by the number of stamens, which are called Monandria, Diandria, &c., as far as Dodecandria, from the Greek words one, two, &c., combined with male (*andria*), because the stamens are compared to males and the pistils to females. Hence the orders are denominated Monogynia, Digynia, &c., to Polygynia, according as the flower has one or more pistils, so called from the Greek *monos* (one), &c., and *gynce*, a female. Thus the jasmine, having two stamens and one pistil, is placed in the second class, and the first order of that class, or *Diandria monogyna*.

The following is a summary of the LINNEAN SYSTEM OF CLASSIFICATION (illustrated by the figures on Plate III.)

Class I. *Monandria* (one stamen).—The first order, Monogynia, contains plants which in the natural system are classed as Scitamineæ; also Hippuris. The second is Digynia.

Class II. *Diandria* (two stamens).—Monogynia contains Veronica (fig. 1), and some Oleaceæ. Digynia contains a grass, Anthoxanthum, and Trifolium, the peeper plants.

Class III. *Triandria* (three stamens).—In Monogynia are found some of the Iris and sedge orders; in Digynia (fig. 11), most grasses; Trifolium, a well-known plant.

Class IV. *Tetrandria* (four stamens).—Monogynia, some Dipsacæ; Digynia, dodder; Trifolium, holly, pond-weed.

Class V. *Pentandria* (five stamens).—Monogynia, some Convolvulacæ (fig. 2), Boraginæ, Primulacæ, &c.; Digynia, some Umbellifera; Trifolium, the sun-rose, elder; Tetragynia, Parnassia; Pentagynia, flax (fig. 4). Polygynia contains no thing of import here.

Class VI. *Hexandria* (six stamens).—Monogynia, some Liliacæ, Bromelacæ; Digynia, rice (fig. 3). Trifolium, dock, meadow-saffron; Polygynia, water plantain.

Class VII. *Heptandria* (seven stamens).—Monogynia, horse-chestnut (fig. 5); Digynia; Tetragynia; Heptagynia.

Class VIII. *Octandria* (eight stamens).—Monogynia, the fuchsia; Digynia, the native eldora; Trifolium, buck-wheat; Tetragynia, Paris (fig. 6).

Class IX. *Ynandria* (nine stamens).—Monogynia, some Lauracæ, Anacardiæ; Trifolium, trifoliate; Hexagynia, the flowering rush.

Class X. *Dodecandria* (ten stamens).—Monogynia, some Rutacæ, Ericacæ, Leguminosæ; Digynia, pinks and saxifragæ; Trifolium, smilax, and some other Caryophyllacæ; Pentagynia, some horse-locks; Decagynia, Phytolacæ.

Class XI. *Polyandria* (twelve stamens).—Monogynia, purple loosestrife (fig. 7), mangosteen, asarabacca; Digynia, arumony; Trifolium, mignemette and Euphorbia; Tetragynia, Callitriche; Pentagynia, Glinum, &c.; Dodecagynia, some Crassulacæ.

Class XII. *Monandria* (twenty stamens).—Monogynia, some of the myrtle, rose, and cactus families; Digynia, the hawthorn; Trifolium, Sesuvium; Pentagynia, the apple, pear, &c.; Polygynia, the rose.

Class XIII. *Polyandria* (many stamens).—Monogynia, rock-roses, peppies, caper, lime; Digynia, peony (fig. 8); Trifolium, aconite; Tetragynia, Winters, Caryocarp; Pentagynia, columbine; Polygynia, buttercup.

Class XIV. *Didynamia* (four stamens, two long and two short).—Gymnospermia, most Labiatæ; the second order is Angiospermia, containing most Scrophulariacæ.

Class XV. *Titradynamia* (six stamens, four long and two short).—This corresponds to the natural order Cruciferae. Those plants with a short pod form the first order, Siliculosa; those with a long pod the second, Siliquosa.

Class XVI. *Monadelphica* (filaments united into one tube).—Triandria, the tamarind; Pentagynia, the passion-flower; Octandria, Aitonia; Decandria, geranium and pelargonium (fig. 9); Endecandria, Brownea; Dodecandria, Monsonia; Polyandria, some Malvaceae.

Class XVII. *Diadelphica* (filaments united into two sets).—Pentandria, Petalostemon; Hexandria, fumitory; Octandria, milk-wort; Decandria, some Leguminosae.

Class XVIII. *Polyadelphica* (filaments united into several sets).—Decandria, Theobroma; Dodecandria, Abroma; Icosandria, Melaleuca; Polyandria, St. John's wort.

Class XIX. *Synpnesia* (anthers united into a tube), includes the Compositae. The first order is called *Polygamia equalis*, in which all the florets have both stamen and pistil (fig. 10), as the dandelion; the second order is *Polygamia superflua*, in which the florets of the ray have only one pistil, while those in the centre have both pistils and stamens, as in the tansy; the third, *Polygamia frustanea*, in which the florets of the centre have both stamens and pistils, but the florets of the ray are without any pistil, as in the corn blue-bottle; the fourth, *Polygamia necessaria*, in which the florets of the centre have only stamens, and those of the ray pistils alone, as the garden marigold; the fifth, *Polygamia segregata*, in which each floret has a little involucre of its own, independently of the common involucre, as in the globe thistle.

Class XX. *Gynandria* (stamens growing out of the pistil).—Diandria, Orchids; Hexandria, Aristolochia.

Class XXI. *Monocia* (stamens and pistils growing in separate flowers, but on the same plant).—Monandria contains the nut-buff tree, Cassia, Cynometrum, Zosteria; Dioecia, duck-wood; Triandria, Sparganium and Typha; Tetrandria (fig. 12), some of the nettle family; Pentandria, xanthium and amaranth; Hexandria, some palms; Polyandria, the Euphorbia or Amentaceae; the next is Monadelphia, with some canifers and spurs; the last, Gynandria, with Anacardium.

Class XXII. *Dioecia* (stamens and pistils in separate flowers, growing on different plants).—Dumalia, willow; Humulus, Hop; Tetrandria (fig. 13), sweet gale, distoe, buckhorn; Pentandria, spinach, hemp, hop; Tetrandria; Hexandria, Black bayberry; Octandria, the pepper; Endecandria, hyssop; also; Pentandria, carab; Dodecandria, Stachys; Monopentria; Icosandria, Rottaria; Eucortia; Polyandria, Brown Cycas; Monadelphica, yew, Lutea's lemon.

Class XXIII. *Polygamia* (stamens and pistils separate in some flowers, united in others, either on the same plant or on two or three different ones).—Monocia, banana, apple, mimosa; Dioecia, the fig, ash, cherry.

Class XXIV. *Cryptogamia* (sexual organs obscure).—In this class there are five orders—fungi, ferns, mosses, lichens, and seaweeds.

The NATURAL SYSTEM OF PLANTS, as devised by Jussieu and DeCandolle, differs materially from the Linnean system just detailed, for it takes into consideration the whole organization of the plant, with its properties and peculiar habits; and the most striking genus of a tribe of plants gives name to the order; as, for instance, the rose forms the type of the natural order Rosaceae. In this manner Jussieu divides the whole vegetable kingdom into fifteen classes, and the genera into one hundred orders. The *cryptogame* plants are separated from the others; the seeds of these plants, which form the first class, being without cotyledons or seed-leaves, and all the others being distinguished into such as have seeds with one or two cotyledons. As the stamens are inserted below the

pistil, on the calyx, or on the seed-vessel, the first description of seeds affords three distinct classes. The plants with two cotyledons next follow, and (from distinctions in the flower-leaves) are divided into those which are apetalous (without petals), monopetalous (single-petaled), and polypetalous (many-petaled). These again are subdivided, according to the insertion of the stamens and the union or separation of the anthers which they support, into ten classes. These, with the four already mentioned, make fourteen. To these the diclinous plants, so called from the separation of the stamens and pistils, are to be added, which completes the number, fifteen. These classes have no appropriate names, but are all distinguished by numbers, with a short definition of the essential character of each.

The following is a summary of LINDLEY'S CLASSIFICATION.

A.—ASEXUAL OR FLOWERLESS PLANTS.

Class I.—*Thallogens*, with stems and leaves undistinguishable.

Class II.—*Acrogens*, with stems and leaves distinguishable.

B.—SEXUAL OR FLOWERING PLANTS.

Class III.—*Rhizogens*, with fructification springing from a thallus.

Class IV.—*Endogens*, with fructification springing from a stem; wood of stem youngest in the centre; cotyledon single; leaves parallel-veined and permanent; wood of the stem always confused.

Class V.—*Dictyogens*, with leaves net-veined and deciduous; wood of the stem, when perennial, arranged in a circle, with a central pith.

Class VI.—*Gymnogens*, with the wood of the stem youngest at the circumference, and always concentric; cotyledons, two or more; seeds quite naked.

Class VII.—*Ergogens*, seeds inclosed in seed-vessels. This class, being composed of innumerable races, is divided into four subclasses, which are again subdivided into various races and natural orders. The first subclass contains the *Diclinous Exogens*, the second *Hypogynous Exogens*, the third *Perigynous Exogens*, and the fourth *Epigynous Exogens*.

The following is a sketch of the CLASSIFICATION OF FLOWERING PLANTS adopted by BENTHAM AND HOOKER in the "Genera Plantarum," the first part of which was published in 1876, and the last in 1883. The flowerless plants will be treated of in the article CRYPTOGAMIA.

CLASS I.—DICOTYLEDONES.

Stem, when perennial, furnished with a pith, surrounded by concentric layers of wood, and that by a separable bark. Leaves with usually netted venation. Floral whorls usually in fours or fives, or multiples of those numbers. Embryo with two (sometimes connate) cotyledons. In germination the radicle lengthens, and forks or branches. Plate I. represents several sections of seeds with two cotyledons. In fig. 1a (apple seed), *c* are the cotyledons, *pl* the plumule, *r* the radicle, all inclosed in the testa, *t*. Fig. 1b is the embryo of the same, taken out of the testa. Fig. 1 is a seedling of the cherry.

SUBCLASS I. ANGIOSPERMEAE.—Ovules produced in a closed ovary, fertilized by the pollen-tube traversing a stigmatic tissue to reach the cavity of the ovary, and hence the embryo-sac of the ovule.

DIVISION I. POLYPETALAE.—Calyx and corolla present, the petals distinct.

Series I. *Thalamiflorae*.—The calyx free from the ovary. The petals in one series, or sometimes in two or many series.

Cohort 1. *Ranaleae*.—Stamens numerous, or if definite the perianth is in three or many series. The carpels are distinct or immersed in the torus. The albumen fleshy

and abundant. This cohort includes the following orders:—Ranunculaceæ, Dilleniaceæ, Calycanthaceæ, Magnoliaceæ, Anonaceæ, Menispermaceæ, Berberidaceæ, Nymphaeaceæ. Fig. 2 is a section of a buttercup; *s*, sepals; *c*, petals; *st*, stamens; *o*, carpels, each containing one ovule; *r*, the torus. Fig. 2*a* is a ripe achene of the same, the seed having a small embryo, *e*, at the base of the albumen, *p*.

Cohort 2. Parietales.—Stamens numerous or definite. Ovary with parietal placentas, one-celled or divided by false dissepiments. Albumen none or fleshy. The following orders are included:—Sarraceniaceæ, Papaveraceæ, Cruciferae, Capparidaceæ, Resedaceæ, Cistaceæ, Violariæ, Canelaceæ, Bixineæ.

Cohort 3. Polygalineæ.—Stamens definite. Ovary generally divided into two cells. The micropyle of the ovules superior; the seed laterally compressed; the albumen fleshy. This cohort includes Pittosporaceæ, Tremandraceæ, Polygalaceæ, Noyssiaceæ.

Cohort 4. Caryophyllineæ.—Stamens definite. The ovary one-celled, with the placenta springing from the base of the cell; the albumen floury, with the embryo curved. The following orders belong to this cohort:—Frankeniaceæ, Caryophyllaceæ, Portulacaceæ, Tamariscineæ.

Cohort 5. Guttiferales.—Sepals imbricate. Stamens numerous. The ovary of three or many cells has the placentas affixed to the inner angles of the cells. This cohort includes Elatinæ, Hypericineæ, Guttiferae, Ternstroemiaceæ, Dipterocarpaceæ, Chlanaceæ.

Cohort 6. Malvales.—Sepals valvate. Stamens numerous and monadelphous. The rest as cohort 5. In Malvales are included Malvaceæ, Sterculiaceæ, and Tiliaceæ.

Coriariæ is an anomalous order.

Series 2. Discifloræ.—Calyx generally free from the ovary. Petals in one series. Stamens definite, inserted on a disc. Ovary superior.

Cohort 7. Geraniideæ.—Ovules pendulous, with a ventral raphe. Geraniales includes Linææ, Humiriaceæ, Malpighiaceæ, Zygophylleæ, Geraniaceæ, Rutaceæ, Simarubaceæ, Ochraceæ, Burseraceæ, Meliaceæ, Chruetaceæ. Fig. 3, *Roscellia Carteri*, *d*, disc; *3a*, a transverse section of the ovary; *3b*, the fruit after the fall of the valves.

Cohort 8. Ovaleæ.—Ovules pendulous, with a dorsal raphe. In this cohort are included Olonaceæ and Illiciæ.

Cohort 9. Celastrales.—Ovules erect, with a ventral raphe. This cohort includes Celastraceæ, Staphyleaceæ, Rhamnaceæ, Ampelidaceæ.

Cohort 10. Sapinduleæ.—Ovules ascending, with a ventral raphe, or reversed. This cohort includes Sapindaceæ, Sabiaceæ, Amcardiaceæ.

Series 3. Calycifloræ.—The tube of the calyx often adnate to the ovary. The petals in one series, inserted on the calyx tube. Stamens numerous or definite, inserted on the tube of the calyx. The ovary included within the tube of the calyx or inferior.

Cohort 11. Rosales.—The carpels are one or more, usually free in bud, sometimes united afterwards with the calyx-tube, or inclosed in the swollen top of the peduncle; the styles are usually distinct. Rosales includes Connaraceæ, Leguminosæ, Rosaceæ, Saxifragaceæ, Crassulaceæ, Droseraceæ, Hamamelidaceæ, Bruniaceæ, Halorageæ. Fig. 4, cherry.

Cohort 12. Myrtaleæ.—Ovary syncarpous, generally divided into cells; the style undivided; the ovules two or many in each cell. In this cohort are the following orders:—Rhizophoraceæ, Combretaceæ, Myrtaceæ, Melastomaceæ, Lythraceæ, Onagraceæ.

Cohort 13. Passiflorales.—Ovary syncarpous, sometimes superior, one-celled, with parietal placentas or divided into cells; the styles distinct, or one style more or less divided. In this cohort are the following:—Samydaceæ, Lonicæ, Turneraceæ, Passifloraceæ, Cucurbitaceæ, Begoniaceæ, Datisceæ.

Cohort 14. Ficoidales.—Ovary syncarpous, sometimes superior, divided into cells with placentas near the base, or more rarely one-celled with parietal placentas. Styles distinct or divided at the apex. The embryo cyclical or excentric. In this are the two orders Cactaceæ and Ficoidaceæ.

Cohort 15. Umbellales.—Ovary syncarpous, crowned by a disc, divided into cells or more rarely one-celled. Styles distinct or divided only at the apex. Ovules solitary in the cells, pendulous. This cohort includes Umbelliferae, Araliaceæ, Cornaceæ. Fig. 5, *Seseli gummuferum*; *5b*, transverse section of fruit; *5a*, longitudinal section of fruit of *Coriandrum testiculatum*.

Moringæ is an anomalous order.

DIVISION II. GAMOPETALÆ.—Flowers furnished with both sepals and petals, the latter connate.

Series 1. Inferæ.—Ovary inferior. Stamens as many as the lobes of the corolla, more rarely fewer.

Cohort 1. Rubiales.—Stamens affixed to the corolla. Ovary with two or more cells; ovules two or many in each cell. This cohort includes the orders Caprifoliaceæ and Rubiaceæ. Fig. 6, *Rudgea recurva*; *6a*, transverse section of ovary.

Cohort 2. Asterales.—Stamens affixed to the corolla. Ovary one-celled, with one ovule. This cohort includes Valerianaceæ, Dipsacaceæ, Calyceraceæ, and Compositæ.

Cohort 3. Campanulæ.—Stamens generally free from the corolla. Ovary two to six celled; ovules numerous, rarely solitary, in each cell. In Campanulæ are included Stylidiaceæ, Goodeniaceæ, Campanulaceæ.

Series 2. Heteromere.—Ovary almost always superior. Stamens generally free from the corolla.

Cohort 4. Friciales.—Stamens twice as many as the corolla lobes, or as many and alternate with them. The following orders belong to this cohort:—Vacciniaceæ, Linaceæ, Monotropaceæ, Epacridaceæ, Daphniphyllaceæ, Loganiaceæ.

Cohort 5. Primulales.—Stamens as many as the corolla lobes, and opposite to them. Ovary one-celled, with free basal placentation. This cohort includes Plantaginaceæ, Primulaceæ, Myrsinaceæ. Fig. 7, primrose; *7a*, seed; *7b*, ripe capsule.

Cohort 6. Thymales.—Stamens as many as the corolla lobes, and opposite to them, or twice as many, or numerous. Seeds few, large. In this are included Sapotaceæ, Ebenaceæ, Stratiaceæ.

Series 3. Liq. ar. chloæ.—Ovary superior. Stamens alternate with, and as many as, the corolla lobes, or fewer. Carpels generally two.

Cohort 7. Gentianideæ.—Corolla regular. Stamens as many as the corolla lobes, or, if fewer, generally alternate with the carpels. To this cohort belong Olacaceæ, Salicaceæ, Apocynaceæ, Asclepiadaceæ, Loganiaceæ, Gentianaceæ.

Cohort 8. Polemoniaceæ.—Corolla regular. Stamens as many as the corolla lobes. Leaves generally alternate. To this cohort belong Polemoniaceæ, Hydrophyllaceæ, Boraginaceæ, Convolvulaceæ, Solanaceæ. Fig. 9, *Nicotiana glauca*, the flower of the tobacco plant; *9a*, seed.

Cohort 9. Personales.—Corolla generally irregular or oblique. The posterior stamen smaller than the rest, or abortive, or wanting. Ovary one or two celled, with numerous ovules. This cohort includes Scrophulariaceæ, Orobanchaceæ, Lentibulariaceæ, Columelliaceæ, Gesneriaceæ, Bignoniaceæ, Pedaliaceæ, Acanthaceæ. Fig. 8, *S. cophylaria*; *8a*, seed.

Cohort 10. Lamiales.—Corolla generally irregular or oblique. The posterior stamen as in Personales. Ovary two to four celled, ovules solitary in the cells. To this belong Myoporaceæ, Selaginaceæ, Verbenaceæ, and Labiate. Plantaginaceæ is an anomalous order.

DIVISION III. MONOCHLAMYDÆ.—Flowers with a single floral envelope, or none.

Series 1. Eumbriceæ.—Ovary generally one-celled.

ovule solitary in the ovary, or one in each cell. Seed with albumen generally floury, and a curved excentric embryo. In this series are included the following orders:—Nyctaginæ, Illecebræ, Amarantaceæ, Chenopodiaceæ, Phytolaccæ, Batidæ, Polygonaceæ. Fig. 10, *Chenopodium*; 10a, seed.

Series 2. *Multiorulata Aquatica*.—Aquatic herbs. Ovary syncarpous, with numerous ovules. Podostemaceæ is the only order.

Series 3. *Multiorulata Terrestres*.—Terrestrial herbs or shrubs. Ovary syncarpous, with numerous ovules. This series includes Nepentaceæ, Cytinaceæ, Aristolochiaceæ.

Series 4. *Micembryæ*.—Ovary of one carpel, or of several free carpels; ovule solitary in each carpel, or more rarely a few in each. The albumen of the seeds copious, with a minute embryo. In this series are the following orders:—Piperaceæ, Chloranthaceæ, Myristicæ, Monimiaceæ.

Series 5. *Daphnæes*. Perianth perfect, the lobes in one or two series. Stamens perigynous. Ovary of one carpel, rarely of two to four carpels, syncarpous; ovules solitary in each carpel, or sometimes two. Trees or shrubs. In Daphnæes are the following:—Laurinæ, Proteaceæ, Thymelæaceæ, Penæaceæ, Elæagnaceæ. Fig. 11, *Cinnamomum zeylanicum*, the flower of the cinnamon-tree.

Series 6. *Achlamydo-sporæ*. Ovary one-celled, ovules one to three in each cell (usually reduced to a naked nucleus). This series includes Lorantheæ, Santalaceæ, Balanophoræ.

Series 7. *Unicaules*. Flowers unisexual. Ovary syncarpous or monocarpous; ovules, one or two in each carpel. Styles as many as the carpels. In this series are the following orders:—Euphorbiaceæ, Balanopseæ, Utriculariæ, Platanaceæ, Leitneriæ, Juglandæ, Myricaceæ, Casuarinæ, Cupuliferæ. Fig. 12, *Euphorbia Lathyris*, the Caper Spurge; 12a, seed.

The following are appendous orders: Salicinæ, Lacistemaceæ, Empetraceæ, Coratophylloæ. Fig. 13, Willow; a, male flower; b, female; c, ripe capsule.

SUBCLASS II. GYMnosPERMEÆ.—Flowers unisexual. Ovules produced superficially on a scale, fertilized by the direct application of the pollen to the apex of the nucleus. Cotyledons two, or sometimes three or many. This subclass includes the orders Gnetales, Coniferae, Cycadaceæ. Plate II., fig. 1, the seed of a pine with many cotyledons; c, chorion; r, end albumen; p. Fig. 1a, the embryo of the same.

Gnetales.—The branches or peduncles of the shrubs proceeding from a woody trunk, jointed. Leaves or scales opposite and undivided. The spikes of flowers in the form of catkins or interrupted. The perianth of the male flower membranous, two lobed; of the female, uticle-like. The column of stamens being from one to eight anthers. 1, 2, 3. *Gnetum Gnetum*, vertical section of female flower; 2a, male flower.

Conifera.—Trees or shrubs. Leaves undivided, reduced to scales or acicular. Male flowers in a catkin, anthers with two or many cells. Female flowers crowded together in a catkin, or cone, more rarely solitary, with one or many ovules on each scale. Fig. 3, scale (aa) from a female cone of *Abies concolor* (the Norway spruce); k, the ovule; k in section, showing the nucleus. Fig. 3a, a male flower.

Cycadaceæ.—Leaves crowded at the apex of the woody caudex. Anthers pinnatisect. Flowers of both sexes in cones; the difference is numerous on each scale of the male cones. Ovules two or more on each side of the female cones. Fig. 4, *Cycas revoluta*, spathe with ripe fruit. Fig. 4a, an anther-bearing scale seen from below. Fig. 4b, a vertical section of the albumen with the embryo in section, the filaments of the undeveloped embryo being drawn out on each side. The embryo appears undivided owing to the cohesion of the cotyledons; the nucleus is superior.

CLASS II. MONOCOTYLEDONES.

Stem without distinct layers of wood surrounding a column of pith, or a separable bark. Leaves with usually parallel venation. Floral whorls when present usually in threes or multiples of three. Embryo with one cotyledon. In germination adventitious roots usually at once proceed from the radicular end of the embryo. Fig. 5, Plate II., section of grain of wheat; p, the albumen; c, the single cotyledon. Fig. 5a, the same germinating.

Series 1. *Microspermeæ*.—The perianth (the inner part at least) petaloid. Ovary inferior, one-celled, with three parietal placentas, or more rarely three-celled, with axile placentas. Seeds very small, numerous, exalbuminous; embryo generally of the same shape as the seed. This series includes the orders Hydrocharidæ, Burmanniaceæ, and Orchidæ. Figs. 6, 6a, 6b, Plate II., *Orchis mascula*; n, anther, consisting of two cells; r, rostellum; s, stigma; l, labellum; t, nectary; p, pollen-mass; c, candle of pollinium; d, viscid disc of pollinium.

Series 2. *Epigynæ*.—The perianth (the inner part at least) petaloid. Ovary superior, very rarely shortly adnate at the base. Albumen copious. This series includes Scitamineæ, Bromeliaceæ, Hamodaceæ, Iridæ, Amaryllidæ, Taccaceæ, Dioscoreaceæ. Fig. 9, Plate II., *Leucojum vernum*.

Series 3. *Coronariæ*.—The perianth (at least the inner part) petaloid. Ovary superior, very rarely shortly adnate at the base. Albumen copious. This series includes Roxburghiaceæ, Liliaceæ, Pontederiaceæ, Philodracæ, Xyridæ, Mayaceæ, Commelinaceæ, Rapataceæ. Fig. 8, Plate II., *Trillium*; s, outer leaves of perianth; c, inner leaves.

Series 4. *Calycinæ*. The perianth calyx-like, small. Ovary superior. Albumen copious. In this series the following orders are included:—Flagellariæ, Juncaceæ, Palmæ. Fig. 7, Plate II., *Arenga saccharifera*, male flower. Fig. 7a, vertical section of female flower. Fig. 7b, vertical section of seed; c, embryo; p, albumen.

Series 5. *Nudifloræ*.—The perianth wanting or reduced to scales or hairs. Ovary superior. Carpel solitary, or if several carpels syncarpous, with one or many ovules. Seeds generally albuminous. This series includes Pandanæ, Cyclanthaceæ, Typhaceæ, Aroideæ, and Lemnaceæ. Fig. 10, Plate II., *Aronia*; s, spathe; sp, spadix; o, female flowers, consisting each of a single carpel; n, male flowers; k, rudimentary stamens. Fig. 10a, seed of the same, in section, showing the embryo with albumen.

Series 6. *Apocarpæ*.—The perianth in one or two series or wanting. The carpels of the ovary superior, solitary, or if several distinct. Seeds exalbuminous. This series includes Triandæ, Alismaceæ, Naiadaceæ.

Series 7. *Glumaceæ*.—Flowers sessile, arranged in heads or spikes, solitary under bracts (or glumes), which are generally imbricated. The segments of the perianth small, scale-like, glumaceous, or wanting. Ovary with one ovule, or divided into cells, each with one ovule. Seeds albuminous. This series includes Ericaceæ, Centrolepidæ, Restiaceæ, Cyperaceæ, and Graminæ. Fig. 11, Plate II., spikelet of oat; q, g, outer glumes inclosing the spikelet of flowers; h and k, flowering glume and palea of a perfect flower; l, another flower in bud.

Further information about the orders enumerated above is given under the respective headings.

BOTANY BAY is situated on the eastern coast of New South Wales. It is capacious, safe, and convenient. The entrance is little more than a mile broad, but the bay afterwards enlarges to about 3 miles in width. Good anchorage is found in 4, 5, 6, and 7 fathoms water; but both on the north and south sides, and on the bottom of the bay, flats extend to a great distance from the shore, having only 4 or 5 feet of water on them. Botany Bay was so called by Joseph Banks, the botanist of the expedition

under Captain Cook, which first visited the spot in 1770, on account of the number of new plants found there. "Botany Bay" is a term often applied to any convict establishment in Australia. It arises from the fact that, after the revolt of the American colonies, Botany Bay was fixed on to take the place of the American convict establishments, though owing to its proving unsuitable for the purpose, the actual station was fixed at Port Jackson, 10 miles further north.

BOTFLY is the name commonly given to insects of the family *Estridae*, belonging to the order *Diptera*. The members of this family are all parasitic in the larval state. The larvæ are called "bots." The antennæ are three-jointed, and the mouth has no proboscis.

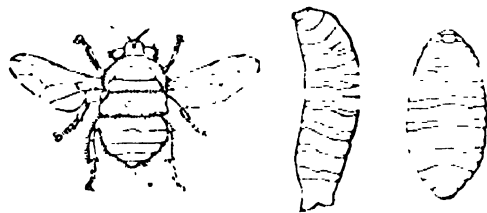
A well-known member of this family inhabits in its larval state the stomachs of horses. This is the *Gastrophilus* or *Gasterophilus equi*. About the latter part of summer the female of this species is to be seen very busy about horses. Balancing herself in the air, she suddenly darts down on some part which the horse can reach to lick with its tongue, and deposits an egg on one of the hairs, to which it adheres by means of a glutinous matter surrounding it; in this manner she continues her labours till she has exhausted her store, to the number of 50 or 100. These eggs may be seen about the legs and shoulders of horses out at grass in August. Two or three days after being deposited they are ready to be hatched. Possibly the horse feels some little inconvenience from all this glutinous matter sticking about and stiffening the hair; he licks the part, and by the pressure of the tongue, and by the mingled influence of the warmth and moisture of it, the ova are burst, and a small worm escapes from each. It clings to the tongue, and is thus conveyed into the mouth; thence it is carried into the stomach. Once there it affixes itself, by means of a hook on each side of its mouth, to the cuticular lining. There it remains until the early part of the summer of the following year, feeding upon the juices which the cuticular lining affords. It has now become an inch long, and is ready to undergo its change of form. It detaches itself from the cuticular coat to which it had adhered, and plunges into the food which the pyloric or digesting portion of the stomach contains, and passes with it through the whole length of the intestines, being discharged with the dung. It then hastens to burrow into the earth, fortunate if it escape the birds that are eagerly watching for it, hollows out for itself a convenient habitation, and assumes the pupa condition. Here it lies torpid a few weeks, preparing to undergo its last change. The perfect fly then bursts forth, rises in the air, and seeks its mate. The work of fecundation being accomplished, the male immediately dies; but the female lives till she has deposited her eggs, when her life also terminates. The numbers of bots or larvæ with which the stomach of the horse is crowded are almost incredible; they occupy only the cardiac portion, and, formidable as they appear, do not affect the health or condition of the horse; at least such instances are rare and accidental. Occasionally they have fastened about the larynx, and produced irritation and a distressing cough, under which the animal has sunk exhausted. The perfect insect is about half an inch long, with very small winglets, and legs of moderate size. It is of a rusty colour, black at the tip of the abdomen.

Another species, the *Gastrophilus hemorrhoidalis*, deposits its eggs on the lips of the horse. The larvæ attach themselves to the surface of the intestine, occasionally producing a slight degree of irritation, till they unfix themselves and are rejected. They then bury themselves, and undergo the regular metamorphoses.

The larva of a species of botfly (*Cephalemyia* or *Estrus onis*) has its abode in the frontal sinuses of the sheep. The fly prevails most in June or July, and is sometimes an intolerable nuisance in wooded countries. Its appearance

greatly terrifies the sheep; they bury their muzzles in the ground, stamp with their feet, and use every means of avoiding its assault. On the other hand, the fly endeavours to get at the inner margin of the nostril, and, darting upon it with the quickness of lightning, deposits her egg. When hatched, the little grub crawls up the nostril, threads the sinuosities of the passage, and finds its way into the extensive sinuses. The irritation which it occasions during its progress is horribly tormenting, and maddens the poor animals. When, however, it has reached its destined habitation the sheep does not seem to feel its presence. These larvæ (seldom more than three or four in one animal) remain till fully grown, and then, detaching themselves from the membrane, begin to descend the nasal cavity, again occasioning great irritation and violent sneezing. The grub when expelled burrows in the earth, becomes a pupa, and in six weeks or two months breaks from its prison a perfect fly. After pairing the male dies, and the female, having deposited her eggs, immediately perishes. She takes no food, for she has no organs to receive or digest it.

The ox botfly (*Estrus* or *Hypoderma bovis*) is a formidable little insect about half an inch in length, with long powerful legs and very large winglets. It is of a blackish-brown colour, with bands of black and coloured hairs. The female of this insect deposits eggs in the cellular part of the skin of cattle by means of an ovipositor consisting of a horny tube shut up in four pieces sliding within each other like a telescope; the terminal portion is made up of five



1. *Estrus trompa*. 2. The larva. 3. The pupa.

points, which together constitute a borer; of these five points three appear to be curved, the other two are straight and shorter. The puncture with this instrument is supposed by some to cause temporary but intense pain, an acrid secretion being, as is imagined, instilled into the wound; and it is from an instinctive dread of the suffering thus produced that the herd is scattered by the fly when it makes its appearance. The larvæ cause tumours called warbles, and supuration takes place in the cellular tissue. The grubs feed on the purulent matter, and as they grow the tumours become more extensive. Each grub is thus the tenant of a cell, at once protecting it and supplying it with nutriment. These tumours have each an external orifice, and this is necessary for the due respiration of the grub; its spiracles are placed at the hinder part of the body, and the position which the grub occupies brings the tail to the orifice, through which it emerges, rising to a level with the external surface. Another object besides the freedom of respiration is answered by this orifice remaining open; it gives a free exit to the purulent matter, and prevents the supuration from extending to a dangerous degree. In due time the grub has attained its full growth, and is ready to assume the pupa state; it now pushes its way through the orifice, and falling to the ground burrows in the earth, passes through a brief season of torpor, and appears in August a winged botfly, to continue its progeny. Many of the grubs, however, perish; various birds watch their progress, and seize them as they are endeavouring to escape. The farmer usually pays too little attention to the warbles of his cattle. They not only inconvenience the animal, but they ruin the hide. The place where the bot has resided will when

the hide is tanned, manifest itself by a want of firmness and equability. It is easy to destroy the bot in its cell, before it has occasioned much mischief, by the firm pressure of the thumb and fingers. Reindeer are attacked by several species of bottlies. (*Estrus trompe* (see fig.) deposits its egg in the nostril of the animal; the larva feeds in the frontal sinuses of the head. Species of this family have been known to attack men. Humboldt saw Indians in South America covered with tumours caused by the larvæ. Bates ("Naturalist on the Amazon") speaks from personal experience of the suffering caused by the grubs of these little insects.

BOTHIE (Gaelic, *bothay*, a hut) is the name given in Scotland to the house on a farm where the unmarried labourers are lodged throughout the year, and sometimes also to the outhouses in which bands of female labourers are lodged during the seasons in which they are employed. Poorly and roughly furnished, and often overcrowded and uncomfortable, the bothie system of lodging labourers tends very frequently towards the encouragement of coarseness and immorality, and though there are many honourable exceptions to such a state of things, some of the modern advocates of reform advise its total abolition.

BOTHNIA is a name which was given at some remote period to the countries on both sides of the Gulf of Bothnia as far south as the straits called the Quarken. It was formerly divided into East Bothnia and West Bothnia; but the former has been ceded to Russia, and constitutes the greater part of the government of Uleaborg. Western Bothnia constitutes with Lapland the most northern portion of Sweden, and contains about three-eighths of its surface. It extends from $63\frac{1}{2}^{\circ}$ to 69° N. lat., and from $14\frac{1}{2}^{\circ}$ to 21° E. lon., and has a surface of about 62,500 square miles. It contains a large plain, gently descending to the sea from the mountains that separate Sweden from Norway. The produce and agriculture vary with the altitude of this plain. Most of the rivers of Bothnia have the termination of *elf* affixed to their names. The Muonio-*elf* forms the boundary on its whole course between Sweden and Russia, and the Torne-*elf* forms the boundary after the junction of the two rivers. The Calix-*elf* rises near the Lake of Tornio, and flows 250 miles to the Gulf of Bothnia. Among the other names of rivers are the Lule-*elf*, the Lilla-Lule-*elf*, the Skellefte-*elf*, the Pite-*elf*, the Umea-*elf*, the Örn-*elf*, and the Väner-*elf*. Bothnia, extending on both sides of the polar circle, has, of course, a very cold climate, though it is much milder than some other parts of the globe in the same latitude. Winter lasts, in general, eight months, from the beginning of October to the end of May, and the cold is very severe. It is followed almost immediately by summer, a few moderate days only intervening between the frost and a great degree of heat. In the beginning of June all traces of winter have disappeared, and the grain is sown. Rye is the principal grain cultivated, and potatoes are largely grown. Black cattle form one of the principal sources of wealth in the provinces, but the stock is limited by the scarcity of meadows; pasture-walks, however, are so extensive, that ten times the present number of cattle could easily be maintained in summer. Butter and hides, which are the principal articles of export, are sent to Stockholm. Horses are rather numerous, and of a middling size. Sheep are only found in the southern districts, and their wool is coarse. The Laplanders have considerable herds of reindeer, and live upon their flesh and other produce. Fish are very plentiful. The forests yield abundance of timber, including birch, pine, fir, alder, and aspen. Three nations inhabit Bothnia—the Finlanders, the Laplanders, and the Swedes. Bothnia, with Lapland, is politically divided into two lands or districts, of which the southern is called Westerbotten, or Umea Lan, and the northern Norrbotten. The Scandinavian word *bothn*, "a lake," is the probable source of the name Bothnia.

BOTHNIA, GULF OF, the most northern part of the Baltic Sea, extends from 60° to nearly 66° N. lat. Between 60° and 61° it lies due S. and N., but the remainder declines to the N.E. Its whole length may be nearly 450 miles. Its entrance is formed by a strait called Ålands Haff, from 36 to 50 miles wide. North of it the gulf widens suddenly, the coasts of Sweden trending to the north-west, so that before it reaches 61° it has attained a width of upwards of 240 miles; which breadth it preserves nearly to 62° . Further north it narrows gradually, till near 61° it forms another strait, called the Quarken. To the north of the Quarken the gulf preserves a width of from 50 to 60 miles for some distance, but it afterwards widens to 100 and even 120 miles. Most of the great rivers of Sweden and Finland discharge into the Gulf of Bothnia. See BALTIC SEA.

BOTHWELL, a populous and extensive parish on the Clyde, in Lanarkshire, $8\frac{1}{2}$ miles S.E. of Glasgow. The inhabitants within the parish, which comprises altogether 13,774 acres, and includes the town of Bellshill, number 23,466; within the village of Bothwell itself, only 7597. In the parish are collieries, iron-works, and freestone quarries. About a mile from the village, towards the S.E., the road to Hamilton is carried over the Clyde by Bothwell Bridge, the scene of one of the most memorable events in Scottish history. The Covenanters, to the number of 4000 or 5000, having taken possession of the bridge, then much narrower than at present, were attacked on the 22nd June, 1679, the bridge forced, and their army totally routed by the Royal forces, under the Duke of Monmouth. Scott has depicted the scene with graphic power in "Old Mortality." The castle is now a ruin, picturesquely situated on a wooded bluff above the river; the surrounding grounds forming a favourite resort for the Glasgow citizens. The church includes portions of the ancient Norman structure; the tower is 120 feet high. The manse was the birthplace of Joanna Baillie, the poetess.

BOTHWELL, JAMES HEPBURN, fourth Earl of Bothwell, is one of the dark characters of history. His career seems to have been utterly selfish and brutal, even to the unhappy queen whose happiness he ruined. He was born in 1526, and was the only son of his father. When the obscure meetings of Protestant communities called *congregations* had gained the patronage of certain enlightened peers, and Scotland began to drift into two religious and political parties, Bothwell vigorously opposed the "Lords of the Congregation." He held several posts of dignity, partly no doubt because of his large estates, for the death of his father in 1556 made him the most powerful noble in the Lowlands; and he must have swallowed his hatred of the dominant lords for the time, since he formed one of the embassy sent to France to bring over the young Queen of Scots, so lately Queen of France, to her new kingdom. This was in the last days of 1560, and probably Mary's undoubted loveliness and personal charm had inflamed his violent passions, for two years later, 1562, he was concerned with the Earl of Arran, an avowed admirer of the queen's, in endeavouring to rescue her from the close surveillance exercised over her by the Presbyterians who surrounded her. Probably Mary was only too willing to be carried off, and also Bothwell's views were not wholly sentimental. He was felt to be a dangerous man by the government, and while Arran was almost disregarded, a strong indictment was framed against Bothwell. He fled across the sea, and lived for the next three years in France, outlawed by the Scots government. After Queen Mary had married her cousin Daruley, in 1565, Bothwell ventured to return, and was at once received into her high favour, and was the heart and soul of her schemes against the authority of Moray. He was present at Rizzio's murder, and escaped unhurt; and this event, while it embittered Mary against her worthless husband, drew her closer to Bothwell,

whose first act was to raise troops to secure her further freedom from such attacks. She even forgot herself so far as to ride 40 miles to see him when he had received a wound from an assassin; and after her recovery from the illness caused by so great a fatigue, Bothwell, determined to possess her at all hazards, set about to procure her divorce from Darnley. As he found Mary not willing to go this length he caused Darnley to be blown up by gunpowder as he lay alone in a house at the Kirk of Field; and so little mystery was made of the matter that public opinion unanimously pointed to the earl as author of the murder. Powerful as he was he was indicted; but he attended his trial with 4000 men-at-arms, and received a sham acquittal. In less than two months from Darnley's murder Mary was loading him with honours, and a marriage was openly spoken of, though Bothwell was married and had no real reason for a divorce. He obtained a divorce, however, on 6th May, by the simple process of withholding the dispensation under which he had married his relative. Bothwell had carried off the queen on the 24th of April to Dunbar Castle, a gift of her own to him, and on 15th May, after he had received a full pardon for the violence used, and had been created duke of Orkney, he was married to the queen at Holyrood. The country rose against the guilty pair, thus married but a few days over three months after the crime which freed them; Edinburgh was seized, and Bothwell and Mary were hardly able to escape to Dunbar. Their forces were hurriedly organized, and met those of the great lords at Carberry Hill. Mary surrendered, and Bothwell fled to the Orkneys. He was captured by a Danish ship, and imprisoned in Copenhagen, whence he was removed to Malmö, and finally to Dracholm Castle. Here he died in 1575, leaving no heirs, and his great estates and titles all forfeit to the crown. He is reported, on slender authority, to have made a deathbed confession exonerating Mary from any complicity in the affair of the Kirk of Field; but there are too many circumstances against the partner of his crime to be set aside by a few words, even if they were ever spoken.

BOTLEY, a parish in the county of Hants, situated at the head of the Hamble creek, and a station on the Gosport branch of the South-western Railway, by which it is distant from London 78 miles, has some trade in corn and flour; but it is best known as having been the residence of William Cobbett, who procured the construction of a direct road from this place to Winchester—11 miles.

BOTRYCHUM. See *MOONWORT*.

BOTRYLLIDÆ is a family of compound ASCIDIANS belonging to the class TUNICATA. These animals are compound and fixed, their tests being fused together so as to form a common mass, in which they are imbedded in one or more groups. Each individual, however, has a distinct branchial and anal orifice, and they are not connected with one another by any internal union. "If, when walking on the sea-shore about low-water mark, we turn over large stones, or look under projecting caves of rock, we are almost sure to see translucent jelly-like masses of various hues of orange, purple, yellow, blue, gray, and of green, sometimes nearly uniform in tint, sometimes beautifully variegated, and very frequently pencilled as if with stars of gorgeous device; now encrusting the surface of the rock, now depending from it in icicle-like projections. These are compound Ascidians. A tangle or broad-leaved fucus, torn from its rocky bed, or gathered on thousands where the waves have cast it after storms, will show us similar bodies, mostly those star-shaped, investing its stalks, winding among the intricacies of its roots, or clothing with a glairy coat the expanse of its foliated extremities. If we keep some of these bodies in a vessel of sea water we find they lie as apathetic as sponges, giving few symptoms of vitality beyond the slight pouting out of tube-like membranes around apertures which become visible on their

surfaces, though a closer and microscopic examination will show us currents in active motion in the water around these apertures, streams rejected and whirlpools rushing in; indicating that however torpid the creature may externally appear, all the machinery of life, the respiratory wheels and circulatory pumps, are hard at work in its inmost recesses. In the course of our examination, especially if we cut up the mass, we find that it is not a single animal which lies before us, but a commonwealth of beings bound together by common and social ties. Each star is a family, each group of stars a community. Individuals are linked together in systems, systems combined into masses. Each member of the commonwealth has its own peculiar duties, but shares also in operations which relate to the interest and well-being of the mass. Anatomical investigation shows us the details of these unions, structures, and arrangements beautiful as wise. Indeed few bodies among the lower forms of animal life exhibit such exquisite and kaleidoscopic figures as those which we see displayed in the combinations of the compound Ascidians." (Forbes.)

In the genus *Botryllus* the external tunic is gelatinous, gristly, and without a stalk. The body is not divided into a distinct thorax and abdomen. The mouths or branchial orifices are simple and arranged round a common *cloaca*. These animals are very small, soft, irritable, and contractile, and are always found adhering to rocks and floating algae, in bunches consisting of from six to twenty distinct individuals, arranged like the rays of a star round a common centre. Each individual is of an oval form, or a little more or less flattened. Ten species have been found in the United States and Europe, six of which are found on the shores of Great Britain. They vary considerably in form and colour, some of them being purple, and others yellow, blue, gray, or green. The genus is represented by *Botryllus polycephalus* (Plate ASCIDIA, figs. 7, 8).

The genera *Polyclinum*, *Sarcinum*, and *Stigillina* differ from the preceding genus in having the body divided into three distinct portions, viz. a thorax with the branched apparatus; a superior abdomen, with the digestive organs; and a post-abdomen with the heart and reproductive organs.

The genus *Polyclinum* has a gelatinous or gristly test, without a stalk, and varying very much in form. The systems are numerous, convex, somewhat star-shaped, each with a central cloacal cavity. The individuals, varying from 10 to 150, are placed at unequal distances from their common centre. The branchial orifices are six-angled and six-rayed, and the anal aperture is prolonged far outwardly and irregularly cut. Six species are known, one of which, *Polyclinum constellatum*, is figured in Plate ASCIDIA, figs. 12-14.

The genus *Sarcinum* has a somewhat gristly, stalked test, and the animals are either isolated or attached gregariously to similar cylindrical bodies. The systems are single, circular, terminal, and comprise six to nine animals. The branchial and anal orifices are six-rayed. Only one species is known, *Sarcinum turgens* (figs. 15-17).

The genus *Stigillina* has a solid, gelatinous test, in form of an elongated erect cone. It is stalked, and occurs either isolated or gregarious. Each cone consists of a single system of many individuals, disposed one above another in irregular circles. The branchial and anal orifices have each six rays. The genus derives its name from a fancied resemblance of the common mass to a seal (*sigillum*), and contains as yet only one species, *Stigillina australis*, from the tropical seas (figs. 10, 11, magnified).

The genus *Distomus* is the representative of all the compound Ascidians, whose body is distinctly divided into two parts, the thorax and abdomen. The branchial and anal orifices have six rays. The test is somewhat gristly, without a stalk, and assumes various forms. The systems are numerous, usually circular, and the individuals are

placed in one or two rows at unequal distances from a common centre. There are several species of this genus, one of which, *Distoma rubrum*, is represented in Plate ASCIDIA, figs. 1-3.

BOTRYOIDAL (Gr. *botrus*, bunch of grapes) is a term used in descriptive mineralogy for a structure developed in many mineral species. It consists of spherical aggregations, which, collected into groups, resemble a bunch of grapes.

BOTTICELLI is the name given to Alessandro Filipepi (born at Florence 1447), one of the most original of the Florentine painters. He studied under Botticello, a goldsmith and worker in metals, and as in many other cases was known by the name of his master. He afterwards entered the school of Fra Lippo Lippi, at whose death in 1468 Botticelli stood forward as one of the leading artists of his time. With the religious sincerity of Lippi, Botticelli combines in his work a fervour which until his time was unknown. His pictures are nearly all devotional, evidently painted under the influence of deep enthusiasm, and containing distinct advices in grouping and tenderness of expression in anything which had gone before. He also tried many experiments, such as the use of gold-leaf to lighten the lights on hair, leaves, &c., with very curious and sometimes brilliant effect. In 1480 he was summoned to Rome by Sixtus IV., and set to work on the great wall frescoes of the Sistine Chapel in the Vatican. The three large pictures which Botticelli contributed to that fine collection are considered to be amongst the best. He continued to work hard at Rome and at Florence with an ever increasing reputation till he fell under the sway of the great preacher and reformer Savonarola. He became one of his most devoted followers, abandoned painting, and is believed to have sunk into poverty. Vasari, almost a contemporary (1512-74), and with accurate knowledge of the Medici family, distinctly says that if it had not been for Lorenzo de' Medici, Botticelli would have died of hunger. Michael Angelo considered him in 1564 as the best site for his famous statue of David, and it may easily be imagined by Botticelli ingraining the art of the Medici, which seems a little inconsistent with the alleged greatness of the artist. Another explanation of the curious decision into which this distinguished man fell at the close of his life is hinted at by the same Vasari, who speaks sincerely of some religious or mystical convictions of Botticelli, and it is quite possible that he may have given the remainder of his life to this unworldly work, satisfied with that enthusiasm which overruled him. One thing is certain, that there are large numbers of Florentine paintings of this date, in a peculiar hard style, the authorship of which is absolutely unknown, and a considerable series of these is upon the "Inferno" of Dante, alluded to by Vasari in the passage which has just been referred to, as one amongst Botticelli's subjects. Botticelli died in 1510.

BOTTLE, the name given to vessels made to hold liquid, which, though greatly diversified in form, are distinguished by their narrow necks from pitchers, vases, jars, &c. The oldest form of bottle, and one that is in extensive use at the present day, is that made from the skin of an animal prepared by tanning. Most of the bottles mentioned in the Scriptures are of this kind, and the references to them can only be understood when this is borne in mind. In the version of the New Testament, issued in 1881, the old term bottle is replaced by the more accurate word wine-skin (Matt. x. 17). The Jews, however, were familiar with bottles of a better kind, and there is a reference (Jer. xix.) to a "petter's" earthen bottle," which the prophet was to shatter as a sign to the people. At the present day the Arabs make skin bottles from the hides of he-goats when a large size is required, using kid skins for smaller sizes. Skins for the conveyance of wine are still used in Southern Europe, especially in Spain, where

they are termed *borrachas*; and specimens of the English *leather bottle*, immortalized in song, are still preserved in museums. Bottles made of metal, earthenware, and glass were also made and used by the ancient Egyptians, Assyrians, Greeks, Etruscans, and Romans. In the British Museum there is a large and beautiful collection of these vessels, some of which are of extreme antiquity, dating from the fifteenth century before Christ, or the period of the Exodus.

BOTTLE-GOURD, a genus of plants, *Lagenaria*, belonging to the order CUCURBITACEÆ. The common bottle-gourd (*Lagenaria vulgaris*) has a fruit in shape like a bottle, when ripe of a pale yellow colour, sometimes 6 feet in length. When dried it becomes hard, and is used to contain water; it is then of a pale bay colour. Other varieties have different forms. The plant may always be recognized by its white flower and the hard covering of the fruit. It occurs wild in India and Abyssinia, and thence has spread into all the warmer regions of the world. The pulp is bitter in the wild plant, and sometimes even in the cultivated variety. The genus *Lagenaria* is characterized by monoecious white flowers with long campanulate calyx with five teeth; the five entire free petals; the stamens inserted into the tube of the calyx with free filaments; anthers cohering into an oblong head included within the calyx-tube; the ovary with three cells, each with many ovules.

BOTTLE-HEAD or **BOTTLE-NOSE WHALE** (*Hyperoodon rostratus*) is the type of a family of Cetacea to which the name "Ziphioid Whales" is often given. This whale is an inhabitant of the north seas, and is seen frequently as far south as the coasts of Britain. It is readily distinguished by the attenuated character of the fore part of the muzzle, which is prolonged so as to resemble a beak, and it was in consequence termed the beaked whale by Pennant. The upper jaw is toothless, and the lower has only two teeth, which are either tusk-like or concealed by the gum. There is a single blow-hole, crescent-shaped and placed in the middle of the head. A small dorsal fin is present, placed far back on the body. The earliest account of a bottle-head is that given by Dale in his "History of Harwich," from a specimen taken off the coast near Maldon, in the year 1717. Its length was 14 feet, the circumference of the body $7\frac{1}{2}$; the flippers being 17 inches, and the dorsal fin a foot in length. A bottle-head whale, 21 feet in length, was caught above London Bridge in 1783, and was examined by the celebrated John Hunter.

BOTTOM HEAT, a term in horticulture expressive of an artificial temperature communicated by means of fermenting vegetable matter to the soil in which plants grow. It is usually obtained either by leaves, or tan, or fresh stable-litter, thrown into a heap, and inclosed within the walls of a brick pit, the surface of which is covered with soil. The object of the cultivator is by such means to prevent the temperature of the soil from becoming less than 60° Fahr. or more than 90°. The plants to which this kind of temperature is applied are—pine-apples, melons, cucumbers, &c., and certain tropical plants cultivated in stoves. See BARK BED.

BOTTOMRY, BOTTOMREE, is a term introduced into the English maritime law from the Dutch. In Dutch the term is *bonarie* or *bodemery*, and in German *bodmerrei*. It is said to be originally derived from *boden* or *bodem*, which in Dutch formerly signified the bottom or keel of a ship, and according to a common process in language, also denoted the ship itself. The same word, differently written, has been used in a similar manner in the English language, the expression *bottom* having been commonly used to signify a ship previously to the seventeenth century, and being at the present day well known in that sense as a mercantile phrase. Thus it is a familiar mode of expression among merchants to speak of "shipping

goods in foreign bottoms," meaning in ships of another nationality.

The contract of bottomry is a pledge of the ship as a security for the repayment of money advanced to an owner for the purpose of enabling him to carry on the voyage. This contract is usually in the form of a bond, called a bottomry bond, and the condition is, that if the ship be lost on the voyage the lender loses the whole of his money; but if the ship and tackle reach the destined port, they become immediately liable, as well as the person of the borrower, for the money lent, and also the premium or interest agreed to be paid upon the loan. The extraordinary hazard run by the lenders of money on bottomry, who, in fact, become adventurers in the voyage, has been held in all countries as justifying them in stipulating for the highest rate of interest. The hypothecation of a vessel may be made by the owners conjointly, or by each part-owner for his share or shares by way of mortgage, under the conditions specified in the Merchant Shipping Act. In France the contract of bottomry is called *contrat à la grosse*, and in Italy *cambio marittimo*, and is subject to different regulations by the respective maritime laws of those countries. If several bottomry bonds are given by the master for the same ship at different times, that which is later in point of time must be satisfied first, according to a rule derived from the Roman law ("Dig." 20, tit. 4, s. 5, 6). The reason of this rule is, that a subsequent lender by his loan preserves the security of a prior lender.

In taking up money upon bottomry, the loan is made upon the security of the ship alone; but when the advance is made upon the lading, then the borrower is said to take up money at *respondentia*. In this distinction as to the matter of the security consists the only difference between bottomry and respondentia. The master of a ship is not justified in selling the whole of the cargo for the necessary repairs of the ship, as that would be to defeat the object of the voyage which the repairs are intended to carry into effect; nor is he permitted to hypothecate the cargo without the ship, or the ship and freight.

The practice of lending money on ships or their cargo, and sometimes on the freight, was common in Athens, and in other Greek commercial towns. The speech of Demosthenes against Læritus contains a complete bottomry contract, which clearly shows the nature of these loans at Athens.

The authority of the master to hypothecate the ship and freight in case of necessity, and in furtherance of the voyage in which he is engaged, at a foreign port, is indisputable, and his hypothecation of the freight or cargo is also justifiable, if necessary; but he must not do so when he can obtain money on better terms on the personal credit of the owner, or when he can communicate with the owner at his residence. It has been held that if this communication could have been made by telegraph the bottomry bond is void.

BOTZEN or **BOLZANO**, a town in Tyrol, the capital of the circle of Brixen, is situated in a pleasant well-sheltered valley at the confluence of the Eisach and Talfer, a little above where their united waters fall into the Adige, 30 miles N.E. of Trent. It is a thriving well built town, in the Italian style; has a castle, several convents, a college, and some manufactures of silk stockings. A strong dyke of masonry, nearly 2 miles in length, and in parts 21 feet thick, has been constructed to defend the town from the irruptions of a neighbouring mountain-torrent. Being intersected by highroads leading to Switzerland, Austria, and Italy, with a station on the railway over the Alps, from Innsbruck to Verona, Botzen has an extensive transit trade. It is also celebrated for its fairs. The country round produces excellent wine, and fruits in abundance. Botzen is supposed to occupy the site of the ancient Roman citadel, *Pons Drusi*. Population, 10,000.

BOUCHER, FRANÇOIS, was born at Paris in 1701, studied under Le Moine, and at the age of nineteen obtained the first prize of the French Academy of Painting. He went to Rome for a short time, returning to Paris in 1731, and in 1735 was elected a member of the academy. He died in 1768, or, according to others, 1770. Boucher was a painter of very great ability, and had extraordinary facility of execution, but he disregarded every correct principle, and devoted himself entirely to a picturesque effect, which consisted in a mere variegated tissue of light and shade. Boucher has been styled the *Amateur* of painting. His subjects were chiefly mythological, amorous, and pastoral, and he painted figures and landscape with equal facility. At the time of his death he was director of the French Academy. His works are still sought after by collectors.

BOUCHES-DU-RHONE, a department in France formed out of Basse Provence, is bounded N. by the department of Vaucluse, from which it is separated by the Durance, E. to the department of Var, S. by the Mediterranean, and W. by the Rhone, which separates the department from that of Gard. Its greatest length is along the coast, where it measures in a straight line 70 miles, but following the windings of the coast 120 miles; its greatest breadth from N. to S. is about 40 miles. The area is 1980 square miles; the population in 1882 was 589,028. Along the coast are some small islands inhabited by fishermen. The principal of them are *Eatonne*, *Pomègue*, *Planier*, and *If*.

The north-east and east of the department is hilly, being covered by the western declivities of the Maritime Alps, which subside with gentle slopes into the basin of the Rhone, but send out south-westwards several dangerous ridges, which end abruptly. The rivers of the department, except the mentioned on the boundaries, are small. The *Hyeron* rises in the department of Vaucluse through a very narrow valley between the Sainte-Bonne ridge on the S. and the Etrole Mountains on the N., and falls into the sea near Marseilles, to which city part of its waters are carried by an aqueduct. A high plain between the Etrole and the Sainte-Victoire Mountains, which lies near westward along the Durance, is watered by the *Aix*, which rises near St. Maximin in the department of Var, and running W. past Aix, falls into the Etang de Berre. This river is subject to inundations, which often cause great ravages; its waters are used for the purposes of irrigation, and as a moving power for machinery. From the highest point of the Sainte-Victoire Mountains, which have so named to commemorate the victory gained by Marins over the Teutones and Cimbri, a ridge called *Trévaresse* runs south-westwards, and terminates in the stony Plain of Crau. The river *Touloubre* rises from the same point, and flows W. past Pellicone and Salen, it then turns S. and falls into the Etang de Berre.

The west and south-west of the department is flat, low, and in many places marshy. At Arles the Rhone divides into two channels, forming a delta, which is called *Le delta de Camargue*. It contains 136,000 acres, about one-fourth of which is cultivated along the channels of the Rhone. The isle is protected from the inundations of the river by great dykes, and it is sheltered from the sea by hills of sand. The soil is a rich alluvium, resting on a bed of sand so strong, impregnated with salt as to affect the herbage, and in some places prevent its growth. The interior of the island is marshy, and contains several large lakes, which have communication with the sea; the largest of these is the *Lac de Valençay*. All kinds of southern produce, corn, fruit, and timber, are grown in the island; and on its rich pastures vast numbers of sheep, cattle, and horses are reared. The culture of rice was introduced from Lombardy in 1817. The isle abounds with water-fowl; locusts often do great damage to the green crops, and in summer the *Cicadées*, as well as the rest of the department, is infested by swarms of

Between the eastern channel of the Rhone and the Etang de Berre, the Trévaresse Mountains, and the sea, lies a vast triangular plain called the Plain of Crau. The greater part of its area, which contains 50,000 acres, is covered with shingle; but there are grassy and woody spots here and there, and its borders and lowest levels are cultivated with success by the system of irrigation. The stones on the desert part of the Crau vary from the size of a pea to that of a man's head; under and between these there is some scanty vegetation, on which, during the winter, large flocks of sheep feed, turning over the stones with their muzzles as they advance. In the cultivated spots, besides common products, the vine, olive, mulberry, and other fruit-trees flourish. The African birds flamingo, ibis, and pelican frequent the lagoons, and the desert surface exhibits the *mirage* in nearly as great perfection as a sandy plain in Africa or Arabia.

The department contains several extensive salt lakes, which communicate with the sea by natural channels or by canals. The largest of these is the Etang de Berre, which is 12 miles long and 10 in circuit. It is entered by the harbour of Tour de Boue, which has a lighthouse and several strong defences. Vessels making for Arles by the canal along the eastern channel of the Rhone also enter by this harbour from the Mediterranean. The Etang de Berre contains vast quantities of eels and other fish. The department is crossed by several canals, the most important of which is the Craponne Canal, which has its summit level in the Durance, and by its branches communicates with the Etang de Berre and the Rhone. The Alpine or Biscan Canal has its summit level in the Durance also, at Malmont; it crosses the N.W. of the department, and divides into several branches, which are distinguished by giving it names from the districts irrigated by them.

In December, January, and February the climate and face of the country are delightful. Frost and snow are rare. During the rest of the year the heat is very great, especially from July to the end of September. Rain seldom falls in summer, and then the sun, though it alternates with a violent, cold, dry wind from the north or north-west, called *mistral*. It is very injurious to vegetation, and so impetuous as frequently to mow houses and blow down trees. Except in the low valleys, the fertilized grounds, or in the neighbourhood of the marshes, vegetation in the summer season seems dead, and the whole surface of the ground is covered with dust. In the intervals of the mistral no equities appear in countless numbers, and from June there is no respite night or day between the months of May and November. Scorpions are not uncommon. The climate is generally healthy, but in the marsh land there are many deaths among the labourers at harvest time.

Owing to the heat of the climate, the soil is almost everywhere arid and parched, and produces nothing without irrigation. Corn is grown in large quantities only in the neighbourhood of Arles. The white wines of Cassis and Coteau, the red wines of St. Louis, in the arrondissement of Marseilles, and those of Château Regard and St. Martin in the arrondissement of Arles, are the most esteemed sorts. The olive is extensively cultivated, and the oils of this department are the best in France. Pecanates, pistachies, almonds, figs, melons, citrons, capers, &c. are abundant. There grow myrtle, rose-hedge, and other odiferous plants, and herbs, fish. Great numbers of light active fowls are reared; cows, goats, and sheep are numerous. The latter are fed in the department only in the winter; during the rest of the year they pasture on the Alpine ridges of the neighbouring departments.

The manufacturing industry of the department is great. The most important products are brandy, soap, vinegar, soda, chemical products, lacdrel, leather, hats, and perfumes. There are several sugar refineries, glass-works, tile and brick fields, silk, cotton and tobacco factories, and

important salt-works along the coast and on the several lagoons. The commerce of the department is very active with all the southern departments, with the Levant, the coasts of Africa and Spain, and the West Indies. The exports consist of the industrial products named, and dried fruits, cork, and colonial produce. Mines of coal, marble, slate, plaster of Paris, chalk, alabaster, and potter's clay, are successfully worked. Iron and lead have been discovered, but they are not worked. At Aix and at Camoins, near Marseilles, there are mineral springs. The department is divided into three arrondissements—namely, Marseilles, Aix, and Arles.

BOUDOIR (Fr. *bouder*, to pout or to sulk—hence a retiring chamber), a lady's private apartment, where she may retire in order to be alone, or that in which she receives only personal and intimate friends. The name has been in use for 600 years in France, but boudoirs only became fashionable there in the reign of Louis XV., when they were introduced by the king's mistress, Madame de Pompadour.

BOUGAINVILLEA is a genus of plants belonging to the order NAGAGNEAE. Some of the species are grown in gardens, and well repay cultivation. Their beauty, however, does not depend upon the flowers, but on the bracts which conceal them, and rival petals in their showy coloring. *Bougainvillea spectabilis* is the best known species. It is a climbing shrub; the flowering branches drooping, and covered with bracts of a rose-violet colour. It is a native of tropical South America.

The genus is characterized by there being three bracts to each flower, but no involucre; the limb of the perianth is pliate, the stamens are hypogynous, and the stigma lateral. All the species are shrubs with alternate leaves.

BOUGIES are long smooth cylindrical instruments used by surgeons for dilating any of the contracted mucous canals of the body. They may be introduced into the urethra, the gullet, the rectum, the entrance to the womb, and the oesophagus tube or canal leading from the throat to the internal ear. They may be solid or hollow, and there is great variety both in their size and shape, and in the materials of which they are composed. Some are made of a strip of fine linen dipped into melting plaster, and afterwards rolled into a long, smooth, even cylinder. Others are formed of cotton threads and wax, of india-rubber, of vulcanite, of catgut, of compressed sponge, and of the stem of the sea-tangle. Metal bougies are made of block-tin, pewter, German silver, silver, or even steel.

BOUGUER, PIERRE, was born at Croisic, in Basse Bretagne, 16th February, 1698. His reputation being established as a profound mathematician, he was chosen, in company with La Condamine and others, together with two Spanish commissioners, to proceed to Peru, for the purpose of measuring a degree of the meridian. Thither he accordingly departed in May, 1735, and remained till 1743. The most essential parts of the operation necessarily fell upon him, as La Condamine was comparatively new to the subject.

The leisure which impediments occasionally gave enabled Bouguer to apply himself to the determination of points not immediately connected with the main object. Among other things, he ascertained the amount of refraction at considerable heights above the sea. He found reason to suspect the effect of the attraction of Chimborazo upon the plumb-line, but not knowing the mean density of the mountain, could not perform the task which Maskelyne afterwards undertook. An account of the whole was published in Paris in 1749, under the title of "Figure de la Terre déterminée." He died 15th August, 1758.

BOUILLON, GODFREY DE, Duke of Bouillon, in the Ardennes, was the eldest son of Gustavus II., count of Boulogne. In his youth Godfrey bore the great standard of the empire, in the service of Henry IV. At the battle of Mersberg, 2nd October, 1081, his sword

sheared off the right hand of the pretender Rodolph, and Godfrey was among the first who scaled the walls of Rome in the subsequent attack upon it. His celebrity in arms, his noble descent, and his general high reputation for both morals and valour, procured him the chief command of the projected crusade to Jerusalem; and after surmounting the difficulties of the passage through Asia Minor, and taking Antioch and Lاذقية, the Crusaders advanced under his leadership to Jerusalem, in May, 1099. Godfrey here encamped his division on Mount Calvary, and after five weeks of severe struggle and suffering the Holy City was carried by storm on 15th July. This is the subject of Tasso's masterpiece, "Jerusalem Delivered." The unanimous voice of the Christian army proclaimed Godfrey first Latin king of Jerusalem, but he rejected the title, and assumed the inferior style of "Defender and Baron of the Holy Sepulchre," saying it "did not become him to wear a crown of gold while his Saviour had worn a crown of thorns." He had almost at once to fight for his young kingdom, for the Sultan of Egypt mustered a large army and attacked Antioch fiercely. De Bouillon gained a complete victory over him in the plain of Ascalon; and pursued his conquest till all Palestine submitted to his rule. With the assistance and advice of those pilgrims who were best skilled in European jurisprudence, Godfrey compiled and promulgated a code named "Les Assises de Jérusalem." He died in 1100, and was buried on Calvary.

BOULDER CLAY, in geology, is applied to a stiff and somewhat sandy clay containing numerous scratched, striated, and subangular fragments and blocks of different kinds of stone, resting in general on the rocks marked in the same peculiar manner as those over which glaciers pass. It is distributed over Polar and some temperate regions, and varies greatly in character and thickness. In mountain regions the masses of boulder clay are thickest in the valleys, and as they extend up the hills they thin out. In valleys and on flats adjoining mountains the clay often occurs in parallel heaps, ridges, and long mounds, known as "drumlins" and "drums." When examined in large masses it is often rudely stratified, and may contain interstratified sands and gravels, often highly inclined. Fossil remains are of rare occurrence; they chiefly consist of fragmentary fossil shells of Arctic genera. Boulder clay usually partakes of the colour and nature of the underlying rock, but the contained striated rock fragments are often very varied, and belong to rocks that are only found *in situ* at some distant locality. When the underlying rock is smoothed and striated, the striae usually run in one direction, but sometimes in two or more, but the axis of the drumlins and the principal lines of striae are parallel. In the vicinity of mountains the boulder clay is of a very local character, being chiefly derived from the adjoining high ground, and the lying blocks being only slightly ice worn, it also contains bedded accumulations (sand, gravel, clay, peat, &c.), and is believed to be the product of land ice or glaciers. To it the term *till* is restricted by some geologists.

The boulder clay deposit extends over the greater part of the British Isles, except the south of England. Its several varieties are particularly well developed in Scotland and Ireland. In the eastern hemisphere it extends to about 50° N. lat., but in the western hemisphere it extends 10° or 12° further south. This deposit was formerly supposed to have been produced by a great flood, hence it is sometimes called "diluvium," but it is now generally believed to be of glacial origin, and to have been produced by the abrasion of the surface rock by a moving mass of ice and stones.

BOULDERs are loose blocks of stone that have been naturally disconnected from the parent rock, and which are found either lying on the surface of the ground, or embedded in clay, gravel, or other superficial accumulation. They are sometimes angular, but more usually either sub-

angular or rounded. Under the general term are included *boulders of dislocation* or of *disintegration*, produced simply by the breaking away of the block from the original rock mass (tumblers), or by the disintegration of the rock *in situ*, when the more resisting portions only remain compact. The blocks to which the term is generally applied are *Eutatics*; that is, boulders removed a greater or less distance from their original location by some transporting power, usually ice, either as a glacier or iceberg. These blocks have a distribution similar to the **BOULDER CLAY**, but are also found in the neighbourhood of mountains rising above the snow line; they are often of very large size, and may be found in very conspicuous positions perched on the side or top of a hill (perched blocks), when they are supposed to have been either placed by a glacier or dropped by a stranded iceberg. The distribution of these blocks, when examined over wide areas, is generally found to proceed in well-marked streams trending, as a rule, southward, but near mountains varying greatly.

BOULEVARD, a French word corresponding to the English words bulwark or rampart. In former times it was applied to all the space occupied by a bastion or curtain in fortifications. In many of the old towns of the Continent the old fortifications have been levelled and the mounds filled up, the space obtained being utilized in the formation of public walks, parks, or additional roads. These in France still retained their old name, and thus the term came to be applied to those wide and beautiful roads of Paris and other cities which form such an important constituent in the outdoor life of the French people. Planted with trees, and provided with broad footpaths, seats, kiosks, &c., they now afford great facilities for promenading and for the transaction of business, and they also serve to promote a free circulation of air through the cities.

BOULOGNE-SUR-MER, a seaport in the department of Pas-de-Calais in France, stands at the mouth of the Liane, which falls into the English Channel, and forms the harbour. It is 157 miles from Paris by railway, and a regular steam communication exists between it and London at Folkestone, the voyage to the former being made in nine hours, and to the latter, which is 28 miles distant, in two hours. The population in 1882 was 43,954, about 1000 of whom are English.

Boulogne occupies the site of the Roman *Gessoriacum*, which was in the territory of the Morini, a tribe of the Belgæ (Mela, iii. 2). It became under the Romans the chief port of embarkation for Britain. The port in Britain, with which a communication was maintained was Rutupia, now Richborough, near Sandwich. About the time of Constantine the name of Bononia was substituted for that of Gessoriacum. In the ninth century it was attacked by Attila and the Northmen. In 1234 Philippe, son of King Philippe Auguste of France, raised new walls to be built, inclosing a smaller space than had been occupied by the Roman town. This inclosure was that of the upper town, at the eastern angle of which a citadel was built by the same Philippe. Boulogne had before this time been erected into a county, of which he had acquired possession by marriage. Boulogne fell into the possession of the dukes of Burgundy in 1435, but was reunited to France on the downfall of that house in 1487. [See BRITAIN, &c.] In 1544 the town, which had been besieged by Henry VIII., was taken by Henry VIII., who added greatly to its defences. One of his knights (buried at Huddes, in Kent) carried off the town gates, and also the famous image of the Virgin from Notre Dame. The image was afterwards returned, but was destroyed with the cathedral at the Revolution. Hence arise the old signs of Bull and Gate (Boulogne Gate) and Bull and Mouth (Boulogne Mouth, &c. of harbour) in London, celebrating Henry's success. Edward VI. restored Boulogne to France in 1550. Here was, in 1804, the central rendezvous of the army

which Napoleon had assembled for the invasion of England. A Doric column erected on the cliff about a mile from the town was commenced by the grand army, but not completed till after the restoration of the Bourbons—an event which it was then made to commemorate. In 1811 it was restored to its original purpose, and surmounted by a statue of Napoleon 16 feet high. The height of the column, which is built of marble, is 166 feet.

Since the peace of 1815 Boulogne has much increased in extent and population. It is largely resorted to as a bathing-place, and many English families have made it their permanent residence. The walls of the upper town have been converted into public promenades, and planted with a double row of trees. They command a view of the lower town, the sea, and in fine weather of the coast of England. The citadel is used as an armoury and barrack, and its vaults are converted into a powder magazine. It was formerly known as Vauban's Citadel. Louis Napoleon was at first confined here after his unsuccessful attempt of 1840, when, with a tape eagle on his hand, he landed at Boulogne. The upper town is the most ancient part of Boulogne; it has narrow irregular streets, but good houses. The lower town extends down the slope of the hill to the river's mouth. This part is regularly built. There is also a large suburb called Capécure, on the left bank of the Liane. The lower town is larger, more populous, and more commercial than the upper town. There is an open space on the north side, which is bordered with trees and surrounded with new streets and elegant houses. The sands are of considerable extent, and form an excellent promenade at low water.

Among the public buildings of the upper town are the Town-hall, said to have been erected on the site of a castle belonging to the counts of Bouillon, in which Geoffroy de Bouillon was born in 1066. Near it is the Bethel, an ancient tower built in the thirteenth century; the Palace of Justice, the ancient episcopal palace, and the prison. The finest building, however, in the old town is the Cathedral of Notre Dame, which was commenced in 1827 on the site of a church built in the twelfth century, though in the ancient crypt, which still remains, an inscription attributes it to the seventh century. There is a tradition that its foundation arose from a boat, without oars or sails, being brought an image of the Virgin to the neighbouring shore in 633. In the lower town are the Hotel of the suburbs, the barracks, the great hospital, a museum, which ranks third in France, and contains collections of natural history and antiquities, paintings, casts, and also the public library of 25,000 volumes. On the edge of the cliff, above the sea bathing establishment, are the scanty remains of a sea-brick walls known as *La Tour d'Ordre* (St. Pierre's Arched Light-house), supposed to have been the foundations of a tower built by Caligula, A.D. 40, when he marched to the shores of the Channel with an army of 100,000 men, intending that he intended to invade the opposite coast of Britain, but contenting himself with gathering a few shells, which he called the spoils of the ocean.

Boulogne is a tidal harbour. The entrance to it is formed by two piers, of which the western extends 2204 feet into the sea, and the eastern 1640 feet. The depth of water between them is at high tides as much as 30 feet; and though this spot is always dry at low water, vessels resting on the mud—the port has recently been vastly improved, so that the largest merchant ships can pass in or out without danger. In 1878-85 a new deep-water harbour was constructed, which always has at least 26 feet of water, and is accessible at all times and in all weathers. A large floating dock of 17 acres, constructed at a cost of more than £250,000, was opened in 1868. It has a quay wall of 1150 yards, and gives great convenience for discharging merchandise. In 1876 a new steam packet station and an extension of the railway were completed, by

which a considerable saving of time was effected in the journey between London and Paris.

The trade of the town is considerable. The herring and mackerel fisheries call into employment a considerable capital, and several vessels are fitted out for the Newfoundland cod fishery. Steel pens, coarse woollens, sail-cloths, herring barrels, nets, and tulle are manufactured. There are also a linen-yarn factory which contains 3000 spindles, glass-bottle works, rope-walks, gin distilleries, sugar refineries, tanyards, tile and brick works, and an extensive iron-foundry.

The value of the imports (the greater part in English vessels) is about £12,000,000 per annum, and of the exports £14,000,000. In aggregate value of imports and exports Boulogne now holds the third place among the ports of France; the return by weight shows imports four times as great as the exports, owing chiefly to the coal cargoes which arrive. The fisheries of Boulogne are yearly increasing in importance. The annual value of the fish taken now amounts to nearly £250,000. The coasting trade is active.

Near the fish-market a statue by Eugène Paul of our countryman Jenner was erected in 1865, as Boulogne was the first place in the country where his system was introduced, in 1800, from England. Churchill the poet; Campbell, author of "Pleasures of Hope;" and Le Sage, author of "Gil Blas," died here; and Sauvage, who claims to be the inventor of the screw propeller, was a native. A statue has been erected to his memory in one of the squares of the town.

BOULONNAIS, a district in the former province of Picardie, now forming the arrondissement of Boulogne, in the department of PAS-DE-CALAIS.

BOULTON, MATTHEW, an English engineer and mechanician, famous as the partner of the more celebrated James Watt, was born at Birmingham 3rd September, 1728. He displayed in early life an aptitude for mechanical work, and on his father's death he purchased a lease of the *Soho*, a barren heath then 2 miles from Birmingham, where he erected some works. In 1769 he entered into partnership with Watt, and commenced the manufacture of steam engines, the partners becoming famous throughout Europe, which for a time they almost wholly supplied. They also used the engine to great advantage in their own works, and greatly improved the machinery used in the manufacture of coins. The union of the two men was of great advantage to both, and the wise liberality of Boulton, who expended £17,000 in experiments before receiving any return, greatly contributed to the successful issue of the labours of Watt. Boulton died at *Soho* on the 17th August, 1809.

BOUNTY, a sum of money formerly paid by government to the persons engaged in certain branches of commerce, manufactures, or other departments of industry.

After the publication of Adam Smith's work on the "Wealth of Nations," bounties began to be regarded with less favour, and have at length sunk into complete discredit. Bounties on production were most commonly given with the view of encouraging the establishment of some new branch of industry, or to foster and extend a branch believed to be of paramount importance. It was also formerly customary to grant bounties on the exportation of various articles, but the impolicy of such a practice is now generally admitted. The history of all businesses carried on by the aid of bounties proves that they are hardly less disadvantageous to those engaged in them than to the public, their general effect being to force the trade of a country into a channel much less advantageous than that in which it naturally runs. The bounty on the exportation of corn was given up in 1815, and that on herrings, linen, and several other articles in 1850. Bounties are not now allowed in England on any article of export. They are, however, still maintained in many other countries.

The word bounty is also applied to a sum of money given to men as an inducement for them to enter the army or navy. The amount has varied according to the exigency of the period, the highest sum being paid during the wars against Napoleon I. In 1812 it reached its maximum, when £18 12s. 6d. was offered to line recruits enlisting for a limited period, and £23 7s. 6d. to those who entered for the full term of service. Of these sums, however, but a small portion was paid in money, the whole of the cost of the outfit being deducted.

BOUNTY, MUTINY OF THE, one of the most remarkable mutinies in the nautical history of England, took place 28th April, 1789. In August, 1787, H.M.S. *Bounty*, a vessel of 215 tons, was fitted out in England, under the auspices of the English government, for the purpose of conveying plants of the bread-fruit tree from the South Sea Islands in order that their growth might be attempted in Jamaica and other West India islands, for the support of the slave population. The ship arrived at her destination, Tahiti (then called Otaheite) in October of the following year, and after a stay of seventy-three weeks set out for Jamaica with 1015 plants on board. The soft, luxurious life led by the natives contrasted sharply with that on board a ship of war, and the dissatisfied feelings of the men were intensified by the strict and harsh discipline maintained by the commander, Captain William Bligh. A plot to gain possession of the ship was formed, and on the day mentioned twenty-five of the men, under the direction of Fletcher Christian, the master's mate, mutinied, seized the captain in his cabin, and forced him with eighteen of the men into the ship's launch, which they cut adrift and then returned to Tahiti. The boat, which had been but slenderly supplied with provisions and water, and was unprovided with either sextant or map, was guided by the captain with amazing courage, skill, and perseverance. The food was carefully measured out from meal to meal, the captain sharing the same rations as the crew; and though the voyagers had to encounter heavy storms and cold in an open boat, they made a successful run of 3618 miles, and landed at a Dutch settlement on the island of Timor, to the E. of Java, without the loss of a man, on 11th June, 1789. The mutineers reached Tahiti in safety, and sixteen of the men took up their residence there; the others, fearing pursuit, sailed away, and ultimately settled on Pitcairn Island. Of the former ten were captured and brought to England by the frigate *Pandora*, which was sent out for that purpose; seven of them were acquitted and three hanged. The refuge of the others was not discovered until 1808, when an American ship, touching by accident at the island, found one of the mutineers, named John Adams, still remaining and living amidst a colony formed by the women who had accompanied the sailors, and the children that had been born there. The other mutineers had fallen victims to their intemperance and evil passions, and the native men had been killed by the women. It was then found that Adams, who had been sobered and subdued by the scenes he had passed through, and who had studied a copy of the Bible that he had found, had done his best for the instruction and regulation of the colony, his efforts being attended with wonderful success. For a further account of these interesting people see PITCAIRN ISLAND. See also "The Mutineers of the *Bounty* and their Descendants in Pitcairn and Norfolk Islands," by Lady Belcher (London, 1870).

BOUNTY, QUEEN ANNE'S. This is a fund for increasing the incomes of the poor clergy, which Queen Anne created in the second year of her reign, out of the FIRST-FRUIT AND TENTHS. These King Henry VIII. had converted, after the Reformation, from a papal tax to a royal tax on the clergy. The fund also advances money to clergymen for improvements in their parsonages, &c. The original charter has been frequently supplemented, the last enactment being 33 & 34 Viet. c. 89. The augmentation usually takes the form of the purchase of about £200 of

land, and the poorest livings are those by law alone eligible for augmentation. If a benefactor offers any sum for a like purpose the corporation will contribute the same amount under certain conditions, even if the living, though poor, be not amongst the poorest; and it is in this way that the fund is chiefly spent. In 1883 there were so many benefactions offered to the church that the corporation could not meet more than half of them.

BOURBON FAMILY, THE. Probably this is the greatest example of a governing family the world has ever seen, for from 1589 to the present day there has never been less than one Bourbon reigning, and frequently there have been two, or even sometimes three, occupying the thrones of various nations at the same time; as for instance, of France, Spain, and Naples in the middle of the eighteenth century.

The first Bourbon mentioned, as far as is yet known, is a certain Adhémar. He was seigneur de Bourbon, a small territory in the middle of France, whose castle later on formed the centre of the province of the Bourbonnais, and later still of the dukedom of Berry. Adhémar flourished about 950, and his successors came to their possessions in due order until Robert, son of St. Louis (Louis IX. of France), married the heiress of the family in 1272; and the Bourbon estates thus passed to the royal family of Capet. The son of Duke Robert and Beatrice de Bourbon was created Louis duc de Bourbon and peer of France (1327) by King Charles IV., the first of the main branch of the Capets. The crown now passed from the main line of Capet to a younger branch of the same line, the Valois.

The descendant of Peter, the elder son of Louis, the first duke, was Susanna, who married for cousin the Duke of Montpensier, celebrated as the Constable de Bourbon. [See BOURBON, CONSTABLE DE.] He pushed to the S. of Rome, 1527, leaving no heirs, his titles and a great part of his estates having already been forfeited through his treasonable practices.

Bourbon Kings of France. From James, the younger son of Louis the first duke, descended the family of Vendôme. Antony, duke of Vendôme, married (1548) Jeanne d'Albret, princess of Navarre, and the son of Antony and Jeanne was Henry, who succeeded to the throne of Navarre. He married the Princess Marguerite of France the childless sister of the three childless brothers—Francis II. (husband of Mary Queen of Scots), Henry III., and Charles IX. (author of the St. Bartholomew massacre), and by his descent from the Capets, strengthened by his marriage with the Valois, he came to the crown of France as Henry IV., when the line of Valois died out in the persons of these three ill-fated sons of the detestable Catherine de Medici. Henri Quatre tried to keep at once France and his Huguenot faith, but found it impossible; so with a ready jest, "Paris vaut bien une messe," he outwardly conformed to Rome, probably not really changing his simple faith, and always remaining a good friend to the Protestant religiousists, as when he protected them by the celebrated Edict of Nantes. Thus the Bourbons became kings of France, 1589. Henry's son was Louis XIII. Louis XIII. had two sons, Louis XIV. (Le Grand Monarque) and Philip d'Orléans. Louis XIV.'s eldest son (Le Grand Dauphin) had amongst his sons Louis (father of Louis XV.) and Philip, duke of Anjou, who became king of Spain. Louis XV. succeeded his great-grandfather, Louis Quatorze. His own son Louis never came to the throne. The grandsons of Louis XV. were—the unfortunate Louis XVI., the victim of the Great Revolution; his brother, Louis Stanislaus Xavier, count of Provence, who came to the throne at the Restoration as Louis XVIII. (Louis XVII. son of Louis XVI., being the poor lad who perished miserably during the Terror); and a third brother, Charles Philippe, count of Artois, who succeeded in his turn as Charles X. Charles X. was driven out of France by the revolution of 1830, and the Orléans branch of the Bourbons

came to the throne; but the Duc de Berry, murdered in 1820 before his father, King Charles, came to the throne, left two children, Marie Louise Thérèse, married to the Duke of Parma, and Henry, count of Chambord, who is, of course, by right Henri Cinq. He is also called *l'enfant de miracle*, since he was born after his father's murder, and when the great Bourbon line seemed to be dying out for ever. "Henry V." is childless, and has never reigned; though he was within an ace of coming to the throne under the unscrupulous Broglie ministry, when MacMahon was president. There is no doubt that if at that critical moment he had not refused to sacrifice the white flag of France in favour of the republican tricolor Henry V. would have reigned over the country of his ancestors.

Orleans Kings of France.—Returning to Louis Quatorze, we find his brother Philip d'Orleans, who married a daughter of our Charles I. of England, left (though not by her, but in second wedlock) a son Philip, intemperate as the Regent d'Orleans, who dragged France down to unutterable foulness during the minority of Louis Quinze. The Regent's son, also a Philip, was a man of middle age at the time of the Revolution, and threw himself heartily into that movement, adopting the name *Egalité* (equality) as a surname. Under the title *Philippe Egalité* he figures largely in that stormy time. Whether he really was republican at heart, or whether he used the Revolution as a ladder to reach at the throne, cannot be with certainty determined, but that he was fickle and false to the core is un doubted. His death by the guillotine in 1793 is not much bewailed. His son, the Duke of Chartres, became Louis Philippe, king of the French, on the expulsion of Charles X. in 1830. King Louis Philippe was himself forced to fly to England in 1848, and died at Clarendon in 1850. His eldest son is dead (by an accident at Naples), but the grandson of King Louis Philippe lives, and bears the title of the *Comte de Paris*. The Comte de Paris may be said to have reigned for a few hours, since his father abdicated in his favour, in 1848, as a last resource, which was in vain, and as "Mr. Smith" he escaped to our shores. The other sons of Louis Philippe are the Duc d'Angoulême, the Duc de Montpensier, and the Prince de Joinville. The Comte de Paris, a knight of the *Croix de Saint-Louis* (Henry V.) is head of the family in June 17, 1871.

Bourbon Kings of Spain.—Again we must revert to Louis Quatorze, who made the grandson of Philip duke of Anjou, King of Spain, by the treaty of Philip V. in 1701, a transaction which cost Europe a fearful price, the troubles ending only with the peace of Utrecht in 1713. The grandson of this Philip V. and the fourth king of the line, was that unhappy Charles IV. with whom Napoleon acted so shamefully at Bayona. Charles abdicated in 1808, in favour of his son Ferdinand, and was made to resign the throne in order to abdicate in favour of Joseph Bonaparte. He arose the great Peninsular War and the calamities of Napoleon's downfall. Ferdinand was restored as Ferdinand VII. in 1813. His daughter was the notorious Isabella, who came to the throne at her father's death in 1833, and who, for her shameful private life and discreditable public career, was driven from the throne in 1868. She formally abdicated in 1870 in favour of her son Alfonso XII., the present king, who, after an interval of an Italian dynasty and a republic, came to the crown of Spain in 1874. His mother, Queen Isabella, was still kept banished from Spain, and lived chiefly in Paris.

Bourbon Kings of Naples.—Philip V., the first Bourbon king of Spain, was unable to retain the sister kingdom of the "Two Sicilies," that is, Naples and Sicily; but after a severe struggle this latter kingdom was given with the consent of exhausted Europe to his son, who ascended the throne as Charles IV. of the Two Sicilies in 1734. Subsequently Charles IV. was called to the throne of Spain, as Charles III. of Spain (1759), and then gave over the

kingdom of Naples to his son Ferdinand, on the agreement that he forfeited the succession to the throne of Spain. Napoleon crushed out the Bourbon monarchy of Naples for a time, but on his fall Ferdinand was restored. His grandson and third successor, Ferdinand II., earned the nickname of *Bomba* for his cruel bombardment of Messina in 1848, and the name stuck to his son and successor, Francis II., the last of the house. The government of "Bomba the second" was exposed in all its hideousness by Mr. Gladstone in some celebrated letters, and fell before Garibaldi in 1860 amidst universal joy.

Bourbon Dukes of Parma.—The youngest son of Philip V., first Bourbon king of Spain, was made duke of Parma by the peace of Aix-la-Chapelle in 1748. His grandson and third successor was made king of Etruria by Napoleon in 1801, but this was only a prelude to the total loss of his "kingdom," swallowed up by France. But in 1817 the "King of Etruria," then Duke of Lucca, regained his former estates, and once more Parma was under Bourbon dukes. The Bourbons continued to rule over Parma till 1859, when the Pavesans revolted and drove them out, voting their own annexation to Sardinia in the same year. The duchess-regent died in 1861.

BOURBON, THE CONSTABLE DE. Charles de Bourbon, duc du Bourbonnais, Constable (that is, commander-in-chief, &c.) of France, was born on 17th February, 1189. He was of the Montpensier branch of the Bourbon family, to the estates of which he succeeded. He was educated at Moitins, and was carefully trained in all athletic exercises; but while his physical education was thus attended to, he did not neglect mental accomplishments. He married the daughter and heiress of Pierre II., duke of Bourbon, to whose title and estate he had also some claims, which were then fore-adjusted by this marriage. He thus became the richest of all the princes of his house who have not worn the crown. The magnificence of the new Duke de Bourbon corresponded with his wealth. His severe character, almost unique in that age, recalls the stoicism of the ancient Romans, and even in so licentious a time made him at once admired and feared.

The first essay in arms of the duke was in the expedition which Louis XII. made in person into Italy, but he returned to France in 1509. In the war of the league of Cambray he had again an opportunity of displaying his military genius.

Upon the accession of Francis I. to the crown Bourbon was immediately (1515) appointed Constable of France, and he devoted himself assiduously to the duties of his new office. He introduced many important regulations respecting the discipline of the troops. He particularly directed his attention to the protection of the citizens and peasants against the insolence and oppression of the soldiers; and his unbending austerity in enforcing the rules he had laid down showed that he fully understood how much a severe discipline conduces to victory. The victory of Marignano, almost at once followed by the fall of Milan, proclaimed Bourbon the foremost soldier of his age. When Francis I. returned to France in 1516 he left the Constable in Lombardy as his lieutenant-general. On his returning to the French court he was received by Francis with great distinction. They soon became estranged, however, owing, it is said, to the influence of the queen-mother, Maria Louisa of Savoy, duchess d'Angoulême, whose advances the Constable is said to have slighted. A breach between Francis and Bourbon was the more easily effected from the contrast between their characters—Bourbon being grave, reserved, thoughtful, profound, and laborious; Francis, gay, impulsive, frivolous, volatile, and idle.

In April, 1521, the Constable's wife, Suzanne de Bourbon, died, and the breach between the court and the Constable daily widened. In a northern campaign against Charles V. Francis gave the command of the vanguard,

which, by a practice established in the French armies, belonged to the Constable, to the Duke d'Alençon. From that moment Bourbon regarded himself as degraded from his dignity. Fresh injuries and insults were heaped upon him; and it was determined to impeach the title of the Constable to his estates, and convey them to the Duchess d'Angoulême or to her son, the king. The duchess would have married him, and thus have compromised the claims, but Bourbon publicly declared that he would never degrade himself by marrying a profligate woman. The cause was brought to trial, and the result may be easily foreseen. The parliament decreed that all the property in litigation should be sequestrated, and he was deprived of the whole of his wife's estates and of his pay as Constable. Francis obtained intelligence that Bourbon had entered into a secret correspondence with the Emperor Charles V., involving a partition of France if the conspirators were successful. Bourbon was also to marry Charles' sister, the Queen of Portugal. Being discovered, the Constable was obliged to make his escape from France, which he did with much difficulty. He then offered his services to the Emperor, and in 1525 the famous battle of Pavia, where Bourbon commanded a body of about 19,000 Germans, afforded him ample vengeance for his wrongs, in the destruction of the French army, and in the capture of Francis.

Bourbon continued in the Emperor's service, but perceived he was an object of distrust; and this feeling had an evil influence on his character. When he was dismissed from Madrid, somewhat abruptly, he formed the daring resolution of forming an army, marching on Rome, and seizing the riches of that famous city, with a view of carving out a kingdom with his own hand, and subsequently taking his revenge on the faithless Emperor. He immediately proceeded to put the plan into execution. This expedition has been considered one of the boldest recorded in history, not only because of its inherent difficulty, but because Bourbon's troops were mere raw levies, without any pretence of proper materials for a siege-troop, or even in many cases of proper warlike arms. After a long and difficult march, on the evening of the 5th of May, 1527, Bourbon arrived before Rome. On the following morning at daybreak he commenced the assault, being himself the first who mounted the wall, and also, according to the French historian, the first who fell. The shot was fired, it is said, by a priest. (Benvenuto Cellini always declared he shot the Constable; unfortunately he is not trustworthy.) The army, however, took the city, in which they committed all the usual excesses of a sack.

Bourbon is reputed to have been one of the kindest men of his age. He is said to have been an exemplary husband, and free from the gross licentiousness of the time.

BOURBON, ISLAND OF. See REXUSON.

BOURBONNAIS, a former province of France. It now forms the department of ALLIER, and the arrondissement of St. Amand, in the department of CHARENTE. Moulins was its capital.

BOURDALOUE, LOUIS, a celebrated French preacher, and one of the greatest orators that country has produced, was born at Bourges 20th August, 1632. At the age of sixteen he entered the order of the Jesuits, and after a brilliant career as a student was appointed by them successively professor of humanity, rhetoric, philosophy, and theological ethics in the Academy of Bourges, and then sent forth as a preacher. In the provinces, where his first discourses were delivered, he attracted immense audiences; and when in 1699 he was called to the pulpit of St. Louis, a Jesuit church at Paris, his success speedily ranked him in the popular estimation with Corneille, Racine, and the other glories of that brilliant period of the French monarchy. A man of high religious character, and profoundly in earnest, he fearlessly assailed the vices of the period, advocating a return to primitive Christianity, not-

withstanding which he was held in high favour at court as well as by the masses of the people. His sermons were marked by an intense zeal for religion, and displayed close and powerful reasoning as well as the qualities of beauty and eloquence, and his popularity lasted for many years. Ten times did he appear at court to preach a course of Lent or Advent sermons, Louis XIV. declaring that an old sermon of his was better than a new one of anybody else. On the revocation of the Edict of Nantes he was sent by the king to Languedoc to confirm the new converts from the Protestant faith, and in this mission he had extraordinary success. Towards the close of his life, as the infirmities of age began to creep upon him, he abandoned the pulpit and patiently devoted himself to the more private duties of his calling. He laboured in hospitals and prisons, visited the sick, and it is said often sat for five or six hours at a time in the confessional to meet those who required his assistance. He died at Paris, 13th May, 1704. Two editions of his sermons were published by his friend Father Bietonmeau, the first in sixteen vols. 8vo (1707-31); and another in eighteen vols. 12mo (1709-31). There have been several editions since, but the first-mentioned is the best. The life of Bourdaloue was written by Médard de Prigny (1705).

BOURG or **BOURG-EN-BRESSE**, the chief town of the department of AIN, on the Rhodan, at a distance by the road of 236 miles south-east from Paris. Its population in 1882 was 14,324. Its chief trade is in corn, horses, cattle, hides, and poultry. The town is the seat of a tribunal of first instance; it possesses a college, a large public library, and several educational establishments. Outside the town is the Church of Notre-Dame, built in 1511 by Marguerite of Austria, wife of Philip II. of France, which is greatly admired as one of the finest specimens of the early Renaissance style, and for its splendid tower. Bourg is very ancient, being supposed by De Thou to occupy the site of the Forum Segusiavorum of the Romans, but according to D'Anville, ruins of the latter are identified with the Forum Segusiavorum. After being long subject to the House of Savoy, Bourg was made to France in 1601. It was the birthplace of Vauclaire the mathematician, and of Laidade the astronomer.

BOURGELAT, CLAUDE, the founder of veterinary schools, and the first to institute veterinary surgery as a distinct profession, was born at Lyons in 1712. He was educated for the law, and practised with success; but having gained an earnest suit, he quitted the profession in disgust, and entered the army. Serving in the cavalry, he had plenty of opportunity for the study of the diseases of horses, animals for which he always had a strong liking. In 1772, with the assistance of Bertram, minister of Lyons, he opened there a veterinary school, which soon became famous, received royal patronage, and attracted students from all parts of Europe. Its success induced the government to found similar institutions in other places, and Bourgelat was made superintendent of the school at Alfort. The merit soon became famous at Lyons, however, continued to maintain its ground, and it remains to this day one of the best veterinary schools in Europe. Bourgelat was the author of numerous works on the different branches of veterinary science, which are still valuable to students. That which enjoys the widest reputation is the "Traité de la Conformation extérieure du Cheval, des Sautes, et des Defauts," which was published at Paris in 1776, and has been translated into several languages. He died at Lyons in 1799.

BOURGEOISIE (French, from *bourgeois*, the inhabitant of a *burgh*), the name now given in France to the members of the middle classes of society who are engaged in trade. It includes all gradations, from the lowest employer down to the master tradesman. Separate from and generally hostile to the aristocracy, it is somewhat remarkable

able that it is the bourgeoisie that is the object of the bitterest hatred and the fiercest attack on the part of the socialist and anarhist agitators of the Continent. In former times the aristocracy and the priesthood were the classes most assailed; but if any dependence is to be placed upon the literature circulating openly or secretly among the discontented operatives and labourers, it is now the employers of labour and the wealthy members of the middle class who are regarded as the worst enemies of the workman, and who would be the first victims of "the revolution." Hatred of the so-called tyranny of capital has superseded hatred of rank.

BOURGES, a city of France, formerly capital of the province of Berry, now of the department of Cher, is situated at the junction of the Auron, the Yèvre, and the Yèvrete, which throw their united waters into the Cher. It is about 70 miles S. by E. from Orleans by railway. The population in 1882 was 33,880.

This city is built on the site of *Avaricum*, which was the capital of the Bituriges Cubi. Avaricum was besieged by Julius Cæsar in the war against Vercingetorix, and taken by storm after a most determined resistance on the part of the inhabitants, who were all put to the sword without respect to age or sex ("Bell. Gall." vii. 13-28). It was afterwards fortified by the Romans, and became at an early period of the Christian era the seat of a bishop. Towards the close of the Roman period it lost the name of Avaricum, which was taken from the *Avana*, now the Yèvre, and assumed that of Bituriges, from which the modern name is derived. In 475 the town came into the hands of the Visigoths, from whom it passed to the Franks, in consequence of the victory of Clovis at Vouillé. In the early ages of the French monarchy Bourges suffered much from the ravages of war, but it was repaired by Charlemagne, and afterwards by Philip Augustus. In the disputes of the Houses of Bourgoigne and Orleans it stood a long siege directed by Charles VI. in person. In 1562 it was seized and garrisoned by the Huguenots, who were driven out of it by the Royal troops on the 1st of September of the same year. Several councils have been held in it; and here, in 1583, the registered constitution, denominated the Pragmatic Sanction, was accepted by the French clergy.

Bourges is divided into an old and a new town, the latter extending on every side round the former, which stands on a hill. The streets are crooked, and the gable ends of the houses, which are old and roted with time, give the town a very lonely aspect. Bourges was formerly surrounded by ramparts, which were defended by twenty-four towers. Some of the towers are still standing, but the ramparts have been levelled and converted into promenades. Within the circuit of the ramparts are several gardens and many open spaces laid out in walks and planted with poplars and limes. Many of the streets present only one way to the view; but within these are good mansions, with courts-yards and gardens. These mansions are inhabited chiefly by gentry of the old regime; a class of nobles who still possesses a large number.

Bourges formerly had a university, established by Louis XI. in 1464, of the greatest repute, but was suppressed at the Revolution, when the town suffered greatly from the massacres of that period. The Cathedral of St. Etienne, which escaped the ravages of the Revolution, is one of the noblest Gothic churches in Europe. It stands on the highest spot in the city; its west front, which is flanked by two massive towers, is pierced by five deeply recessed portals, all richly ornamented; the central one presenting a sculptured representation of the last judgment. The edifice is 495 feet long and 111 feet wide. The vaulted roof of the nave, which is 121 feet high and 40 feet wide, is supported by columns 55 feet high, and of great delicacy of workmanship. The interior is lighted through fifty-nine magnificent painted windows, some of which are as old as the

twelfth century. The town-hall was formerly the house of Jacques Cœur, the richest subject of his time, whose treasures enabled Charles VII. to reconquer the country from the English. This edifice is in the richest style of the architecture of the fifteenth century. The archiepiscopal palace is a building of great magnificence; the garden attached to it is used as a public promenade. The other remarkable buildings are the Churches of Notre Dame and St. Bonnet, the prefect's house, built on the site of the old palace of the dukes of Berry, and the house of Louis XI., a beautiful structure of the Renaissance style. Louis XI. was born in this town; and it is also the birthplace of the celebrated preacher Bourdaloue, Jacques Cœur, and other distinguished persons.

Bourges is the seat of an archbishop, whose see consists of the departments of Cher and Indre. He formerly took the title of Primate of Aquitaine. There is in the town a public library containing 20,000 volumes, an ecclesiastical college, a theatre, several hospitals, a museum of antiquities, a lyceum, primary, normal, and superior schools, Catholic seminary, learned society, chamber of agriculture, &c. The chief manufactures are broadcloth, blankets, cutlery, saltpetre, jewelry and plate, beer, and leather. Of these articles, and of corn, hemp, wool, skins, and wood, the trade of the city consists.

In 1861 Bourges was chosen as one of the great military arsenals of France, on account of its central position, and its strategic importance has increased since the loss of Metz. Extensive military workshops are constructed near the Semman, and on the banks of the Cher.

BOURGOGNE. See **BURGUNDY.**

BOURIGNON, ANTOINETTE, a celebrated religious enthusiast, and founder of a sect which acquired much importance under the name of the Bourignon Doctrine. She was the daughter of a Lille merchant, and was born in the year 1616. Being singularly ugly, she became an object of dislike to her mother, in consequence of which her childhood was passed in solitude and neglect, and the first books she got hold of chancing to be "Lives of the Early Christians" and mystical tracts, her ardent imagination acquired the visionary turn that marked her life. Through the kindness of the Archbishop of Cambrai she was admitted into a convent, and placed over a small society of nuns; but afterwards losing his favour returned to private life. On the death of her parents she became the possessor of independent means, and in 1653 had charge of a hospital at Lille. Driven from this on account of her extravagant ideas she fled to Holland, and there declared herself to be inspired by God with a new revelation. She published numerous books and pamphlets, and gathered round her a band of disciples. Her character, in which pride, love of money, and a wild visionary ecstasy were strangely commingled, proved a great barrier to her success as the founder of a new sect; but she had many followers at the time of her death, which took place at Franeker, 30th October, 1680. Her works were published by Peter Poiret, a Calvinistic minister, in twenty-five vols. (Amsterdam, 1676-84; second edit. 1717), and their perusal appears to have had considerable influence over the ministers of the Presbyterian churches of Scotland in the beginning of the eighteenth century. So far did this extend that every minister at his ordination was for a long period required to renounce Bourignonism among other heresies that were named, and this is still required by the Established Church of that country.

BOURNE, HUGH, founder of the Primitive Methodist Connection in England, was born 3rd April, 1772, at Fordhays, near Stoke upon-Trent, Staffordshire. He became a zealous preacher in connection with the Wesleyan communion, and in company with some of his brethren endeavoured to revive the old practice of holding open-air camp meetings for revival services. This movement

was discountenanced by the Wesleyan Conference, and Bourne and a friend and brother minister named William Clowes left the connection in 1808. In 1810 they commenced a new organization under the name of the Primitive Methodist Connection. This society, though small at its commencement, has since largely increased in numbers and influence. Bourne visited America in 1811, where his preaching attracted vast crowds. He died at Bemmersley, in Staffordshire, in 1852.

BOURNEMOUTH, a popular watering-place on the coast of Hampshire, where the Bourne rivulet falls into Poole Harbour, $4\frac{1}{2}$ miles from Christchurch, and 116 from London by the South-western Railway. Bournemouth has become a very favourite resort for sea-bathing, and a winter residence for invalids, owing to the climate being peculiarly mild and genial, the thermometer registering an average maximum of about 71° in July, and a minimum by night in January of about 35° . The situation of the town is one of rare and striking beauty, embracing lovely landscapes and magnificent sea-views. Near the town are some large pinewoods, the fragrance from which is much favoured as a health restorer by doctors. The buildings are very genteel, consisting mostly of detached villas, lodging-houses, and excellent hotels, with a public library and reading-rooms. A sanatorium for consumptive patients was opened here in 1866, and in 1867 the Herbert Convalescent Home, a very handsome Italian building, was erected on the West Cliff, in memorial of Lord Herbert of Lea. A handsome town-hall, capable of accommodating 1000 persons, was opened in 1875. There are various smaller rooms, used chiefly as public offices. In 1880 a handsome pier was opened. It is 838 feet long, and for a distance of 650 feet 35 feet wide, whilst the remainder is 110 feet wide. There is a convenient landing-stage for steamers and boats attached. The population in 1881 was 16,859.

BOUR'NOUSE or **BURN'OUS**, the name of a long loose cloak, with a hood made to cover the head, used by the Arabs of Algeria and Morocco, and by the Bedouins of Arabia, Syria, and North Africa. It is composed of white woollen cloth, and is worn outside the other clothing. It is occasionally seen in Spain, where it is known under the name of *albarnoz*. By the Algerine Arabs it is termed *nugrabin*, and this name is sometimes used by those of Syria. In a modified form it has been introduced both into France and England.

BOURRIENNE, LOUIS ANTOINE FAUVELET DE, the secretary and biographer of Napoleon, was born at Sens, 9th July, 1769. He was educated at the military school of Brienne along with Napoleon, with whom he formed an intimate friendship. They quitted school together in 1785, and in 1789 Bourrienne received an appointment as attaché to Vienna, from whence he proceeded to Leipzig, where he studied public law and foreign languages. In 1792 he returned to Paris, where he renewed his intimacy with his former comrade; and when Bonaparte was appointed to the command of the army of Italy, Bourrienne was employed by him to revise the treaty of Campo-Formio along with General Clarke. He accompanied Napoleon through the Italian and Egyptian campaigns in the capacity of private secretary, and in 1801 was made a councillor of state. In 1802, being implicated in the fraudulent bankruptcy of the firm of Coulon, army contractors, he was dismissed, but in 1805 he was sent as chargé d'affaires to Hamburg. Here he embezzled large sums of public money, but being discovered he was recalled to Paris and compelled to disgorge 1,000,000 francs that he had appropriated. He now became a decided enemy to Napoleon, and on the Restoration of 1814 he held office for a time under Talleyrand. In 1815 he was specially excepted by Napoleon from his amnesty of Lyons, and he fled with Louis XVIII. to the Netherlands. On the final overthrow of the empire

he became a minister of state, was elected a deputy for the department of Yonne, and retained his seat until 1828, when he had to run from his creditors and take refuge in Belgium. Here he completed his "*Mémoires sur Napoleon*," &c., which were published at Paris (1829-31) in ten vols. This work, which contains many interesting particulars respecting the life of Napoleon, has had a wide circulation both in England and France; but the accuracy of many of the author's statements were challenged by the friends of Bonaparte. Some of his mistakes and errors were exposed in a work by Bonlay de la Muerthe, entitled "*Bourrienne et ses Erreurs volontaires et involontaires*," (Paris, 1830, two vols. 8vo). The events of 1830 and the pecuniary embarrassments to which he was subjected affected his brain, and he had to be removed to a *maison de santé* near Caen, where he died 7th February, 1831.

BOUSTROPHE'DON (Gr. *bous*, an ox; and *stropho*, I turn), the oldest form of writing practised by the Greeks. In this the letters were written down without punctuation or division of words, the first line being written from right to left, and the second from left to right, and so on alternately. It is recorded that the laws of Solon were in the first instance written in this manner, and coins and inscriptions have been found with the letters similarly arranged. This method received its name from its resemblance to the path taken by an ox when engaged in ploughing.

BOUTS-RIMÉS (French, rhymed endings) is the name given to verses made to fit certain rhymes or verse endings previously agreed upon. This amusement originated in France, where it was suggested by a disaster which befell a court poet named Dulot, who was robbed of his manuscripts, in which he had written rhymes for 300 sonnets, leaving the lines blank to fill in as occasion required. It was afterwards introduced into England, where it enjoyed a limited popularity for a time, but it is now very seldom resorted to as a means of diversion. As an illustration of the way in which it is carried out we may suppose the following rhymes selected:-

burn,
sigh
turn,
be;

To these a stanza of four verses might be fitted as follows:-

'Tis with joy's purest flame that I—burn;
'Twas your eddiness that caused me to—sigh
If my passion can wake no re—turn,
Soon beneath the green tart I shall—be;

or,

With no martial ardour I—burn,
Not for fame on the field do I—sigh;
For fighting I ne'er had a—turn,
Did I say that I had I should—be.

BOVEY TRACEY, a town in the county of Devon, 220 miles by rail from London, stands on the slope of a hill at the base of which the river Bovey flows. Across it is an ancient bridge of three arches. The one historic memory of Bovey is the surprise and defeat of part of the force of Lord Wentworth on the 9th January, 1646, by Cromwell, on his march into the west. The parish takes its name from the river Bovey, a tributary of the Teign. It was long held by the Traceys, one of whom took part in the murder of A'Becket, and hence the dedication of the church to St. Thomas of Canterbury. There is an old west-country proverb that the "Traceys have the wind in their faces"—a mark of the divine displeasure for their share in this transaction!

The Bovey heathfield, extending at the base of the town, is a low tract about 8 miles in circuit, surrounded by hills which open to the south-east, in which direction the Teign flows after being joined by the Bovey. The granite hills on the outskirts of Dartmoor rise on the west side, and the greensand range of Haldon on the east.

BOVEY TRACEY BEDS are a series of lignites and clays of limited extent, occurring in Devonshire. The deposit is of Lower Miocene or Oligocene age, and consists of two distinct divisions, viz. the lignites of Bovey Tracey, and the clay beds and sands of Kingsteignton and Newton Abbot. The relation between these is somewhat obscure, as they are separated by a fault, but it would appear that the latter is the deeper portion of the series. In the lignite beds numerous vegetable remains have been found, from which Dr. Oswald Heer has determined their age. The deposit was formed in a fresh-water lake, where water lilies and similar water plants grew, and into which a stream flowed carrying clay and sand derived from the granite of Dartmoor. About the lake were woods of the evergreen oak, cinnamon, fig-trees, vines, and large conifers (*Sequoia Contissa*) allied to the *Wellingtonia* of California, also tree-ferns (*Pecopteris*) and other plants indicative of a subtropical climate subject to seasons of heavy rain.

The lignites have been worked for about 150 years, but are of inferior quality, containing much pyrites, which gives off an unpleasant sulphurous smell when they are burning, and by decomposition often produces spontaneous combustion in the waste heaps.

The clays are much used in the potteries as "Teignmouth clay," so called from the port where it is shipped; they have also been used for "whitening stone," and for the manufacture of alum.

BOVIDÆ is a family of *UNGUICATA* or hoofed mammals. The group of animals included in this family constitute a division of the hollow-horned *RUMINANTS*, which, although very closely allied to the sheep and antelopes, are easily recognized by their bulky and massive appearance generally, and particularly by their broad muzzle and powerful horns. A still more striking characteristic is to be seen in the lateral direction of the horns, which usually incline upwards, or forwards in a crescentic manner. The horns differ from those of deer in being persistent, and consisting of bony processes of the forehead bones covered with a sheath of horn, and from those of antelope in being rounded, and not spirally twisted. The stomach is complex. In the structure of the teeth this family presents the usual characteristics of Ruminant. The upper jaw

has no incisor teeth, the vacant space being occupied by a callous pad of hardened gum. The lower jaw is invariably furnished with six incisors and two canines, the latter being closely approximated to the incisors, and resembling them very closely in form and size. There are six molar teeth on each side of either jaw, a wide vacant space intervening between them and the canines. The flattened crowns of the molars are surmounted by two double and irregularly crescent-shaped folds of enamel, the convex outline being directed inwards in the upper and outwards in the lower teeth. With regard to the economic purposes which this family subserves, they are not second to those of any other group of animals, for they supply us with capital in the form of labour, fat, milk, leather, horns, &c. Geographically they enjoy a wide distribution, both in the eastern and western hemispheres, whilst numerous fossil remains testify to their abundance in Post-pliocene times, and a few remains have been found in Pliocene deposits.

The following are the names of the most remarkable of this family, which are noticed under their respective headings:—BISON, BUFFALO, GAUR, GAYAL, MUSK-OX, OX, URUS, ZEBU.

BOVINO, an episcopal town in the province of Foggia, Italy, 18 miles S.S.W. of the city of Foggia. There are a cathedral, several churches, and a court of primary jurisdiction. A battle was fought here in 1734 between the Imperialists and the Spaniards, in which the former were victorious. The ancient name of the town was *Vibinum* or *Vibonium*. The population in 1882 was 7494.

BOW, a suburb of London, 4 miles E.N.E. of St. Paul's Cathedral. The river Lea is here crossed by an ancient bridge. The parish church is of great antiquity, and of a mixed style of architecture, with a low square tower. Large breweries, flour-mills, dye-houses, chemical works, &c., afford occupation. Bow was formerly called Stratford-le-Bow. The population of the parish in 1881 was 101,133.

BOW is the instrument by means of which the strings of the violin family are set in motion. Originally it was simply a bent elastic rod, from end to end of which a little horsehair was stretched. Fig. 1 shows the ancient form of bow, still used in Algeria with the slightest alteration, the form as given here being copied from ancient illuminated

FIG. 1.

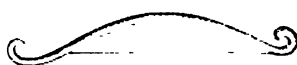


FIG. 2.

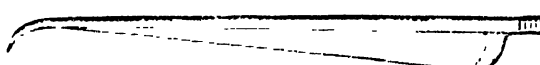
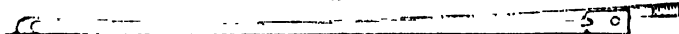


FIG. 3.



MSS. Illustrations of players of the *BRUCKA*. In the 14th and 15th century MSS. the bow bears the converse shape to that of fig. 2, the stick being of the form of the *Y* in the cut of that illustration; the stick, therefore, being bent in one only. The next development was to the form of fig. 2 as shown, where the stick is almost straight, and the nut is made to project in a curved manner from the hilt of the bow. This will be recognized as a favourite form of bow amongst the heavenly choirs dear to Fra Angelico and the other painters. A rack was next invented, in order that the nut, now made movable, could be adjusted as to tension or loosen the hair. The great Contrabasso restored the curve at the tip of the bow, so as to free the hair throughout, each end of the stick being gently curved, and for the rack substituted a screw running into the nut along the wood of the bow itself, so that the hair could be adjusted with the greatest nicety. Finally, Tourte (1747-1833) introduced the form now in use (fig. 3), where the hair is kept flat and regular by clasps at each end, the stick gently curves inwards, tapers throughout, and is delicately adjustable as to tension

by the screw passing up the hilt of the bow into the nut, which last works in a small groove in the stick. Tourte first discovered Brazil wood to be the best material for bows, and arrived at such proficiency in balancing and tapering the stick, &c., that a Tourte bow is now as much sought after as a Cremona fiddle. Dodd (1705-1810) and Panormio are also famous old makers; Tubbs and Chanot enjoy a great present reputation.

The length of the violin bow is about 29½ inches, a viola (or tenor) bow 29 inches, a violoncello bow 28½ inches or less. These differ only in becoming heavier and thicker in the order named. About 200 white horsehairs, or a little over, are generally used in a bow.

The double-bass bow retains the older form of Corelli, with firm curves at each end of the stick, is made of beech, is haired with black horsehair, and is grasped in the palm of the hand instead of being held by the upper joints of the fingers, as are the other bows.

In each case resin is rubbed on the hair of the bow, to give it a greater bite on the strings, and also to counteract the natural oiliness of the horsehair.

BOWED INSTRUMENTS. See STRINGED INSTRUMENTS.

BOWER-BIRD is the name given to a group of Australian birds belonging to the order PASSERES, and interesting on account of the singular habits from which their name is derived. These birds construct, under the shelter of overhanging branches, a bower-like gallery, in which they amuse themselves by running backwards and forwards as if enjoying the pleasures of a dance. The Satin Bower-bird (*Ptilonorhynchus holosericeus*), an inhabitant of the forests of New South Wales, measures about 13 inches in length, and is of a brilliant blue-black colour, with the wings and tail black and the bill and feet yellow. The female is of an olive colour, with the wings and tail brown; the lower surface is streaked with black, and the front of the neck with white. The bower of this bird is placed under the sheltering branches of a large tree, and is described by Gould as consisting of a large platform of sticks firmly interwoven, on the centre of which the true bower is raised, this being composed of finer and more flexible twigs so arranged as to curve over, and nearly meet at the top, the

materials being placed so that any forks on the twigs may project outwards, thus leaving a perfectly free passage for the birds through their singular edifice. This curious structure has nothing to do with the nest, but appears to be simply a place of resort for numerous individuals of both sexes, which play about the platform and run through the arch formed by the bower apparently for the mere purpose of amusing themselves. These assemblies, however, are also connected with the courtship of the birds, although Gould states that the bower is seldom entirely deserted. The platform and its vicinity are always ornamented with a variety of objects, such as shells and small bones, and the bower itself with bright-coloured feathers. Scarcely anything seems to come amiss to the birds in the embellishment of their favourite resort, and the natives are so well aware of their habit of carrying off anything that they can fly away with, that on losing any small article they seek it at the nearest bowers, not uncommonly with success.

The Spotted Bower-bird (*Chlamydera maculata*) displays even more elegance of design in the preparation of its bower than the satin bird. Gould describes the bowers of this



Bower of the Satin Bower-bird.

species as "considerably longer and more avenue-like than those of the satin bower-bird, being in many instances 3 feet in length. They are outwardly built of twigs, and lined with tall grasses so disposed that their heads nearly meet; the decorations are very profuse, and consist of bivalve shells, crania of small mammalia, and other bones. Evident and beautiful instances of design are manifest throughout the bower and decorations formed by this species, particularly in the manner in which the stones are placed within the bower, apparently to keep the grasses with which it is lined fixed firmly in their places. These stones diverge from the mouth of the run on each side, so as to form little paths, while the immense collection of decorative materials, bones, shells, &c., are placed in a heap before the entrance of the avenue, this arrangement being the same at both ends."

The constructors of this curious edifice inhabit the

interior of the Australian continent. They are about the same size as the satin bower-bird, and their plumage is of a brown colour, elegantly spotted and variegated with yellow. The lower surface is grayish-white, with indistinct brown lines on the flanks, and across the back of the neck is a broad rose coloured band, composed of somewhat elongated feathers, forming a broad crest.

The name is also applied to other birds who display similar instincts. The Gardening Bower-bird (*Ampelis inornata*), of which a specimen may be seen in the Zoological Gardens of London, not only builds a bower to play in, but ornaments the surrounding ground with the most beautiful living flowers and richly coloured fruits.

BOWIE-KNIFE, the name given to a strange and dagger-shaped knife having a long cutting edge and a sharp point, the shape of which was designed by Colonel James

Bowie of the Southern States of America. It formed part of the regular equipment of a miner during the early days of the Californian gold mining, and was always carried by the rangers engaged in Indian warfare. It is still a favourite weapon with the rowdies and desperadoes of New York. From its terrible effectiveness in a hand-to-hand struggle, it has been suggested that it should be supplied to the troops when they are called upon to encounter savage tribes, but up to the present the bayonet forms the only weapon of the kind supplied to the infantry soldier in the British army.

BOW-LINE, in a ship, a rope fastened to the bridles of the square sails, for the purpose of tightening the edge of the sails in a storm.

BOWL'ING, or **BOWLING BAY**, a village of Scotland, in the county of Dumbarton, on the right bank of the Clyde, where it enters the Frith of Clyde, 9 miles N.W. of Glasgow, picturesquely situated at the foot of the Kilpatrick Hills. Here the Forth and Clyde Canal enters the Clyde, and there is a dock for steamers which are damaged or laying up for the winter months. Here also is one extremity of the Roman Wall, constructed with exact reference to the present levels. The Forth and Clyde Canal enables vessels to pass from the one frith to the other across Scotland; at the time it was made it was considered a triumph of skill. It was one of Smeaton's works. Close to Bowling is Dunglass Point, with the ruins of Dunglass Castle upon it, and a monument to the memory of Henry Bell, who first introduced steam navigation into Britain by the launching of the *Comet* steamer on the Clyde in 1812. The population in 1881 was 773.

BOWLS, GAME OF. This is one of the oldest popular recreations throughout the British Isles. It is not known when it was first introduced, but it is referred to by writers as far back as the end of the twelfth century. It appears to have been played in the earliest times with stone balls which were cast at each other, a cone, for a mark to be aimed at, being introduced later. The game was frequently interdicted by the law, partly because it interfered with the practice of archery, and partly because, owing to its being chiefly played in alleys maintained by innkeepers, it became associated with drunkenness and gambling. The frequent repetition of these statutes would infer that they were generally disregarded, though the law on the subject was not repealed until 1815, when by the 8 & 9 Vict. c. 100, s. 1, bowling and similar games of skill were permitted to be played. During the eighteenth century the practice of playing bowls in an alley gave way to the playing on open greens prepared for the sport; and it is as an open-air game that it has retained its popularity in England and Scotland, being played more in the latter than in the former country.

The first requisite for this pastime is a stretch of well-turfed lawn to form a bowling green. This should be as smooth and level as possible, and should be from 90 to 120 feet in length, and of a proportionate width. A plot of ground 100 feet long by 80 in width would allow of three games being played at one time. Many bowling greens are made of much larger dimensions than this, to allow of a greater number of players, as many as eight or ten sets being accommodated on some of the greens in Scotland. The game may be played by two or more persons, eight generally making a full set. The bowls used are now generally made of lignum-vitæ wood, being from 6 to 8 inches in diameter, more or less oval in shape, and having one side shaved smaller than the other so as to impart a bias. Each player is usually provided with two bowls, a smaller white ball perfectly spherical, about 3 inches in diameter, being used as a mark and called the *jack*. In playing, the white ball is thrown more than half the length, or nearly to the end of the green; and the players, who stand at the other end, endeavour to throw the bowls so that they may lie as near as possible to the

jack. The distance is measured, if necessary, by means of a cord attached to a peg, and passing freely through another, or by means of a reed or stick. One bowl is thrown by each side alternately, the side whose bowl is nearest reckoning one point or shot, and the game proceeds until the number agreed upon beforehand, 7, 9, 14, 21, or 31, is reached, the first to reach it winning the game. The great charm in the game consists in so mastering the bias of the bowl as to direct it at will; and shots of a surprising character are frequently made by experienced players either to strike the jack directly, or to fall as near as possible to the mark. One of the clearest works on the game is "Mitchell's Manual of Bowl Playing" (Glasgow, 1864).

BOWRING, SIR JOHN, an author and diplomatist of great ability, was born at Larkbeare, near Exeter, in 1792, and early displayed a taste for the study of modern languages and of natural history and chemistry. Before he was of age he was sent abroad to attend to the commercial interests of his father, Mr. Charles Bowring, the family having for some generations been engaged in the woollen manufacture. He had thus an opportunity of visiting Russia, Sweden, Finland, and Germany, and of making that intimate acquaintance with European literature which was conspicuous in his subsequent publications. Mr. Bowring early became the intimate companion and political pupil of Jeremy Bentham, whose works he afterwards edited and published in twenty octavo volumes. He published translations, chiefly poetic, from works in more than thirty languages and dialects; and the catalogue of the British Museum shows that his translations, songs, hymns, original poems, distinctly of a literary character, amount to more than fifty volumes.

His public career commenced in 1828, when he was commissioned to report on the public accounts of Holland. After performing in France a mission similar to that he had already discharged in Holland, he was in 1832 appointed secretary to the commission for the reform of public accounts, and prepared these resolutions which became the law of public accountants in Great Britain and in the colonies. About the same time he was appointed commercial commissioner to France, with a view to the extension of commercial relations between England and that country. He was also sent on commercial missions to Egypt, Syria, Lombardy, Tuscany, Rome, Switzerland, and Belgium, and represented Great Britain at the meeting of the Zollverein in 1838 at Berlin. He assisted in forming the leagues which aided in effecting the abolition of the corn laws, and wrote the report of Mr. Hume's committee on the import duties, a report which was translated into all the commercial languages of Europe, and circulated by hundreds of thousands. He entered Parliament as member for Blackburn in 1832, and with some intermissions retained a seat until 1849, when he accepted the British consulate at Canton. The duties of a difficult position were here discharged with considerable tact, but not obtaining the official recognition from Peking due as the representative of Great Britain, Mr. Bowring returned home, and in 1854, after ascertaining the views of the French emperor, proceeded again to China, this time (having been knighted in the meantime) as her Majesty's plenipotentiary, chief superintendent of trade in China, and governor of Hong-Kong. Under the article CHINA will be found described the part taken by Sir John Bowring in opening up British intercourse and trade with that empire. In 1859, after a visit to Siam, he returned home, being shipwrecked in the Red Sea on his passage. His last official public employment was in 1861, when he was sent to Italy on a mission respecting British commercial relations with that newly-established kingdom. He died 23rd November, 1872.

BOWSTRING HEMP, the fibre of an East Indian genus of plants (*Sansevieria*) which belongs to the order

LILIACEÆ. The fibres of the leaves are used for bowstrings by the natives. *Sansevieria Roxburghiana* is a native of India, and its fibres can be made into string and cordage. Its leaves are 3 or 4 feet long, and very narrow. *Sansevieria guineensis* grows in Africa.

BOX-DAYS. Two days appointed by the judges of the Court of Session in Scotland in each spring and autumn vacation, and one day during the Christmas recess, for the lodging or filing of papers ordered by the court towards the close of the previous session. In inferior courts the sheriff is required by statute to appoint one court day at least during the vacation for similar purposes. The name is derived from a practice, introduced in 1690, of providing a box having an opening in it something like that of the modern letter-box, to receive informations and bills, each judge having his own box, of which he alone had the key.

BOX HILL, a favourite resort of Londoners, in Surrey, about 3 miles from Dorking. It is much admired on account of its great beauty and the extensive view obtained from its summit. It is a chalk hill at a bend in the North Downs, rising sharply to the height of 445 feet above the river Mole. Its summit and sides are clothed with box and yew trees, which in their evergreen colour contrast well with the white of the chalk wherever it becomes apparent.

BOXING, fighting with the fists. Combats of this kind, engaged in as a manly exercise, or as a means of settling a dispute, can be traced back to a very remote period. It formed a regular part of the contests at the ancient Grecian games, and often also of the gladiatorial displays so popular during the Roman empire. The boxers who took part in these conflicts wore over their hands a thong of leather, sometimes loaded with a piece of lead or iron, which was fastened securely to their wrists and arms. [See CESTUS.] Sometimes also, as a means of protection against the terrible blows thus rendered possible, they wore a cap or helmet of leather. One of the ancient Greek deities, Pollux, was celebrated for his prowess in boxing, and in an idyl of Theocritus there is given a full account of his contest with the giant Amycus, during the voyage of the Argo. The combatants are described as bringing both strength and skill into play, and the poet portrays in a vivid manner the tremendous blows delivered and their effect upon the faces and bodies of the boxers. Only free Greeks were allowed to take part in these encounters, and freemen who had been found guilty of any crime were forbidden to do so. At later periods, in common with other sports, boxing fell into the hands of professional athletes and gladiators who fought for gain, and it became dishonourable among ordinary citizens. In England it has always been popular, and is by many of the poorer classes still looked upon as a peculiarly proper and "English" method of settling a quarrel. In public schools its popularity is such that it generally flourishes in spite of all the regulations laid down by the masters, and there are not wanting many intelligent writers who defend the custom. Perhaps the best known vindication of the practice is that contained in "Tom Brown's School-days," and the fight of that hero with Slogger Williams gives a very fair picture of the regular and business-like manner in which such a battle is carried out in a well-conducted school. Boxing as a profession was at one time also highly popular. It was patronized by all classes of society, from royalty downwards, and among the entertainments provided for foreign potentates a prize fight was frequently included. A series of these fights were got up for the delectation of the allied sovereigns and their generals in 1814, and a prize fight was arranged as a spectacle for the Emperor Nicholas of Russia in 1817. An exhibition of boxing was also included among the many sports that were provided for the entertainment of the Shah of Persia on his visit to this country

in 1873, but in the latter case the combatants were gloved. The most famous prize fight of modern times was the celebrated encounter between Sayers and Heenan, the respective champions (in boxing) of England and America, which took place in 1860. There was a great disparity in the size of the men; but much endurance was displayed on both sides, and after a conflict lasting over two hours the interference of the police caused it to result in a drawn battle. It was subsequently announced by the Home Secretary, in the House of Commons, that all who had taken part in it had broken the law—even the spectators being liable to punishment. Since then the police have managed to put down these contests in public; and as in one or two cases the spectators have been fined or imprisoned as well as the combatants, it is probable these exhibitions will be altogether suppressed in future. Boxing as a sport, however—the combatants being provided with padded gloves—is still very popular. In most of the large towns boxing clubs are to be found, the members of which contend occasionally for prizes; and in the assaults-at-arms which are now so frequent the boxing is always the most favoured part of the entertainment. As the law does not interfere with boxing as a sport, some of the lower classes have taken advantage of the fact to endeavour to revive professional pugilism, and the same thing prevails in the United States of America; and severe conflicts sometimes take place, in which the boxers are considerably battered and bruised notwithstanding the gloves worn. For those who are able to control their temper, and who require severe athletic exercise, boxing is a very useful sport, as it serves to bring nearly every muscle of the body into play, and when properly conducted it is certainly not more dangerous than football. There are numerous handbooks published which profess to give instructions in the "noble art," and in most large towns one or two "professors" earn a livelihood by giving lessons and taking part in exhibitions of boxing.

BOXING THE COMPASS is a nautical term derived from the Spanish *bocar*, "to sail round." It simply means the repetition in proper order of all the various points of the compass. The ability to do this correctly is required of every sailor, and it is generally one of the first things learned by those who adopt the naval profession.

BOX TEL, a town in the province of North Brabant, Holland, situated on the left bank of the Dommel, 6 miles south of Boss-le-Duc. It is famous for the beautiful damasks that are produced. At Boxtel was fought, on the 11th August, 1794, an obstinate action between the French and the allied British and Dutch troops, under the command of the Duke of York. The latter were defeated with considerable loss, and obliged to retire behind the Maese. The population in 1883 was 4,300.

BOX-THORN. See LYCUM.

BOX-TREE (*Buxus*) is a genus belonging to the order EUPHORBIACEÆ, or Spurge family. There are nineteen species, of which six are natives of the north temperate regions of the Old World, one of Madagascar, one of tropical Africa, and the rest of the West Indies. The two kinds best known are *Buxus sempervirens* and *Buxus balcanica*. The former, or common box, forms a large evergreen bush or small tree, found in mid and south Europe, Algeria, and as far east as Persia. In this country it is only indigenous on Boxhill, in Surrey. Many varieties are known in gardens, the most remarkable of which is the dwarf-box. *Buxus balcanica* (the majoreca-box) is a handsomer plant than the other, with broader leaves, and has a more rapid growth; but greater care is required with it, as it is only able to withstand a very moderate amount of cold. It is a native of the Mediterranean islands, of Asia Minor, and Turkey. The wood of both kinds is extremely valuable, and is very largely used for wood engravings. Most of the native box-trees of Australia are species of *Eucalyptus*.

BOYAR or BOYARD. See BOYAR.

BOY-BISHOP, a mock official who for several centuries used to be elected in connection with the church on St. Nicholas Day (6th December), and whose imaginary jurisdiction lasted till St. Innocent's Day (28th December). A lad, generally chosen from among the choristers of a cathedral, was selected, and instituted to office by a series of ceremonies copied from those used in the election of a real bishop. A number of subordinates were appointed to assist, who with the boy-bishop took possession of the church and performed imitation services, that of the mass being forbidden. They also went, with singing and dancing, from house to house, blessing the people, and probably receiving contributions towards the maintenance of the sport. The custom appears to have prevailed in most Catholic countries, being especially popular in England. The office was in some places one of considerable importance, inasmuch as the power of disposing of such prebends as became vacant during the term of authority fell to the disposal of the boy-bishop. If he died during his term of office the funeral honours of the episcopacy were granted him. The custom was abolished in England by royal proclamation in 1542, during the reign of Henry VIII. It was permitted again under Mary, but was condemned by her successor Elizabeth, in whose reign it finally disappeared. See "Account of Boy-Bishop of Salisbury," by Dr. Rimant, published by the Camden Society (London, 1875).

BOYCE, DR. WILLIAM, was born in the city of London in 1710. He received his musical education from Mr. King, Dr. Greene, and Dr. Pepusch. In 1736 he succeeded Weldon as one of the composers to the chapel-royal, and in performing the duties of the office produced two services and many anthems which reflect so much honour in the English school of church music. Some years afterwards he set to music Edward Moore's "Solomon," a serenata, and a diuina culla "The Chaplet." In 1749 he was created Doctor of Music, and in 1755 he succeeded Dr. Greene as Master of the King's Band. In 1758 he became organist to the chapel-royal. He died in 1779, and was buried in St. Paul's Cathedral. Like the great Beethoven, Boyce (though happily to a far less degree) suffered from deafness, the greatest calamity possible to a musician. Boyce produced an excellent collection in three volumes, of "The Cathedral Music of the English Composers;" and wrote a large number of sacred pieces, many of which are still in use in our cathedrals.

BOYD, ZACHARY, a Scottish vine and author, was born towards the close of the sixteenth century. He was educated from the Boyds of Piddell, of Ayrshire, and received his education in the University of Glasgow. He afterwards studied at Saumur in France, and in 1611 was appointed regent of the college. After holding this office sixteen years he was compelled to leave, on account of the persecution of the Protestants. He returned to Scotland, becoming successively domestic chaplain to Sir William Scott and the Marquis of Hamilton, and minister of the Leamy Church, Glasgow. He was elected rector of the University there three times, his years of office being 1634, 1635, and 1645. When Cromwell visited Glasgow after the battle of Dunbar, the magistrates and ministers quitted the city in a body, with the exception of Boyd, who not only remained at his post, but in his sermon at the High Church, alluded at the English satirists, in the presence of Cromwell and his officers, that it is said one of the latter asked permission "to pistol the scoundrel." This Cromwell refused, and at the close of the sermon asked the undaunted preacher to dine with him, afterwards spending the evening in religious conversation and protracted devotional exercises. Boyd died about the end of 1653 or the beginning of 1654, leaving liberal legacies to the Glasgow University, in gratitude for which his bust, with an appropriate inscription, was erected within the court of the college. During his lifetime he published nineteen separate

works, leaving many more behind him in manuscript. The most celebrated of his productions are a prose work entitled the "Last Battell of the Soull in Death," issued in 1629; a treatise cast in the form of a dialogue between Pastour, Sicke Man, Spiritual Friend, Satan, Michael, &c.; and "Zion's Flowers," sometimes designated Zachary Boyd's Bible, a collection of quaint homely verses on Scriptural subjects.

BOYLE is a market-town of Ireland, county of Roscommon, about 25 miles north by west from Roscommon, on the river Boyle, which flows from Lough Gara into Lough Key. The town appears to have risen under the protection of a Bernardine abbey, the ruins of which exist on the left bank of the Boyle Water, about a quarter of a mile below the town bridge. The bridge over the river is a handsome structure, 100 feet long and 42 feet wide, of three arches. There are two other bridges below the town, which is the mart of the surrounding district. Boyle is a station on the Midland Great Western Railway. The public buildings are the Episcopal church, two Roman Catholic chapels, a new market-house, a lecture-room, and large barracks. The chief articles of trade are grain, butter, and flax. The population in 1881 was 2994. Boyle returned two members to the Irish Parliament until the Union, when it was disfranchised. In a cemetery not far from the town the famous Irish bard Carolan lies buried.

BOYLE LECTURES. See **BOYLE, ROBERT**.

BOYLE, RICHARD, Earl of Cork, was born at Canterbury in 1566. His family was respectable, but it was first rendered illustrious by Richard Boyle himself, who from the post of clerk in the service of the chief baron of the Exchequer rose to the highest honours of the state; and as if they were insufficient to mark the sense which was generally entertained of his abilities, it has been usual to style him "the great Earl of Cork." He was educated at Benet College, Cambridge; was engaged in a humble occupation by Sir R. Manwood, chief baron; and in his twenty-second year he went to Dublin in quest of a situation more suitable to his active disposition. His first employment was to draw up memorials and other documents for individuals connected with the government, by which means he acquired considerable insight into public affairs. In 1595 he married one of the co-heiresses of a gentleman of Limerick. His wife died and left him in possession of £500 a year, arising from landed estates. He increased his property by considerable purchases in Ulster. The envy of several influential persons was excited by his prosperity, and they severally addressed letters to Queen Elizabeth, stating that Mr. Boyle made so many purchases of landed property as to occasion suspicion of his being aided by some foreign prince. Mr. Boyle had resolved upon repairing to the English court in order to defend his interests and character, but the rebellion of Munster broke out before he could quit Ireland. His estate was ravaged by the rebels, and, as he himself states, "I could not say that I had one penny of certain revenue left me."

He now returned with forlorn prospects to the Temple; but when the Earl of Essex was sent to Ireland he was received in the suite of that nobleman. His former enemies made another attempt to crush his surviving hopes, and were so far successful as to occasion his being put under confinement. On his case coming before the English Privy Council he was fortunate enough to secure the presence of the queen, who listened with interest to his able and successful defence. Before he concluded he exhibited the principal instigator of the proceedings (Sir Henry Wallop, treasurer of Ireland) in the character of a public speculator. A new treasurer was immediately appointed, and Boyle was made clerk of the council of Munster. He returned to Ireland to discharge the duties of his office, and on the Spaniards and Tyrone being defeated with great loss, was sent to announce the victory to the English court. His fortunes

now took a more prosperous turn than before. He bought at a low price the Irish estates of Sir Walter Raleigh, which contained 12,000 acres, and by prudent and judicious management greatly increased their value. Anxious for a large infusion of English blood into the various districts where he had purchased estates, he successfully held out favourable terms for Protestant immigrants. At a subsequent period, when Cromwell was shown the improvements which he had effected, he remarked that if there had been an Earl of Cork in every province the Irish would not have become rebels. In July, 1603, Mr. Boyle married a daughter of Sir Geoffrey Fenton, principal secretary of state, on which occasion the lord deputy of Ireland knighted him on his wedding-day. In 1616 he was created Lord Boyle, Baron of Youghall; and in 1620 Viscount Dungarvan and Earl of Cork. He died in 1644.

BOYLE, ROBERT, the seventh son of the preceding, was born on 25th January, 1626, at Lismore in Ireland. At eight years old Boyle was sent to Eton, where he studied assiduously; thence he was taken to Stalbridge in Dorsetshire, where his father had gone to reside. After studying under a private tutor, he travelled on the Continent. At Geneva the occurrence of an awful thunder-storm awakened religious feelings which actuated him greatly in after-life. At this period he sedulously attended to Hebrew, Latin, Greek, and French. In 1641 he went from Geneva to Italy, where he was attracted by the writings and experiments of Galileo. He returned to England in 1641, and his father being dead, he resided on the Stalbridge estate till 1650, leading a quiet life amid the turmoil of the period.

It was about 1646 that Boyle began to turn his attention to practical science. After various journeys to his Irish estates, he settled at Oxford in 1654, and remained there till 1668. On the accession of Charles II. in 1660, he was pressed to enter the church, but declined. In 1663 he became one of the founders of the Royal Society. Boyle was not quite exempt from the credulity of his times. He was a believer in the so-called miracles of Valentine Gretnakes, and in the appearance of an "unclean spirit" in France. He was to some extent a believer in the transmutation of metals. In 1680 he was elected president of the Royal Society. He died 30th December, 1691, and was buried at St. Martin's in the Fields, London.

Boyle was never married. He was tall, slender, and emaciated; excessively abstemious in food, and somewhat oppressed by low spirits; but at the same time of such copiousness of conversation and wit as induced Cowley to rank him in that respect among the first men of his age. He constantly refused a peerage, though the personal friend of three successive kings. He was always a moderate adherent of the Church of England.

Coming after Bacon, and being contemporary with Newton, Boyle followed out the new mode of scientific investigation. The air-pump became in his hands almost a new machine; the propagation of sound by the air was investigated by him; he determined the absorbing power of the atmosphere, the elastic force of steam, and made an approximate estimate of the weight of the air. As a theological writer he was very prolix, though calm and argumentative. He laid by an estate, the annual proceeds of which were to be applied, for ever, to the payment of a preacher, on condition of preaching eight sermons in the year for proving the Christian religion against notorious infidels, viz. atheists, theists, pagans, Jews, and Mohammedans. The first series of "Boyle Lectures" was delivered by Richard Bentley in 1692. They are now preached at St. Mary-le-Bow Church, Cheap-side, London, on the first Monday in each month from January to May and from September to November. They have been sometimes published.

BOYNE, RIVER, rises in the Bog of Allen, in the county of Kildare, Ireland, having a general north-east course, past Trim, Navan, Slane, and Drogheda, to the Irish Sea, which it enters 4 miles east of the last-named town. Here the Dublin and Belfast Railway crosses the river by a fine viaduct 95 feet in height. There is a bar at the mouth, over which vessels of about 400 tons can pass at high water. The tide ascends $6\frac{1}{2}$ miles, and the river has been made navigable for barges of 70 tons for 19 miles. The Boyne will be ever memorable in British history for the important victory gained on its banks, about 3 miles above Drogheda, on the 1st of July, 1690, by the forces under the command of William III. over those of James II. In 1736 an obelisk, 150 feet in height, was erected in commemoration of this great event, on the point facing the ford at Oldbridge, 2 miles west of Drogheda, where King William was wounded in the arm on the evening previous to the battle.

BRABANÇONNE, the national song of Belgium. It was composed by a young French actor named Jeuneval, and was first used during the revolution of 1830. The music was composed by Campenhout, a singer, who was afterwards made director of music in the royal chapel. The author of the poem fell in a battle with the Dutch, and his mother was pensioned by the Belgians. Each verse of the song terminates in the punning refrain—

*"La mitraille a brisé l'épée,
Sur l'arbre de la liberté."*

BRABANT, DUCHY OF, formerly one of the most important provinces of the Netherlands, was bounded N. by Holland and Gelderland, E. by Gelderland and Liege, S. by Hainault and Namur, and W. by Flanders and Zealand. The title count of Brabant was first assumed early in the twelfth century, by Godfrey the Bearded, count of Louvain; but at the close of the century his great grandson took the higher title of duke. In 1191 the son of the Countess of Flanders, into whose hands Brabant had come, became Duke of Brabant. This prince was killed at the battle of Agincourt. Passing to the house of Austria in 1190, it became a possession of Spain. In the middle of the seventeenth century, the northern portion of the duchy successfully revolted from the Spanish rule, but Southern Brabant was not freed until 1711.

As a state Brabant possessed a constitution, called the *Joyeuse Entrée*, *Byde Inkomen*, which was a great protection to the liberty of the people. Laws could not be passed without the consent of the clergy, nobles, and representatives of the principal cities, and the towns could refuse assistance in military expeditions. It also compelled the duke to take legal action against his subjects only in the regular courts.

In 1815 the congress of Vienna formed the whole of the seventeen provinces of the United Netherlands, including North Brabant and South Brabant, which comprised the ancient duchy, into the kingdom of the Netherlands; but at the revolution of 1830 South Brabant joined the Belgians, and has since formed a part of the kingdom of Belgium.

BRABANT, NORTH, one of the Dutch provinces, is bounded N. by South Holland and Gelderland, from which it is divided by the Maas; E. by the Belgian province of Limburg, and the Prussian Rhine Province; S. by Belgium; and W. by Zealand. It lies between $51^{\circ} 12'$ and $51^{\circ} 50'$ N. lat., $4^{\circ} 12'$ and $6^{\circ} 0'$ E. lon.

The principal rivers of North Brabant are the Maas, which forms for some distance its northern and north-eastern boundary; the Dommel, which enters the province near Valkenswaard, and joins the Maas at Crevecoeur; the Aa; and the Merk. The capital is Bois-le-Duc. The surface is quite level, and generally well drained. The soil is in some places highly fertile, producing the cereals, flax, madder, hops, and orchard fruits, and in others hopelessly

barren, forming extensive moors covered with heath. The manufactures comprise woollens, linens, cottons, damasks, carpets, lace, leather, and earthenware, and there are many breweries, but the chief employment is agriculture. The population of North Brabant in 1883 was 480,000, seven-eighths of whom are Catholics.

BRABANT, SOUTH, the metropolitan province of the kingdom of Belgium, is bounded N. by the province of Antwerp, E. by those of Liège and Limburg, S. by those of Hainault and Namur, and W. by East Flanders. It lies between 50° 32' and 51° 3' N. lat., and 3° 53' and 5° 10' E. lon. The area of the province is 1269 square miles, and the population in 1883 was 1,040,000, almost all of whom are Roman Catholics.

The province contains 811,587 acres, nearly all of which are cultivated or productive. The forest of Soignies, part of the remains of the great forest of Ardennes, is contained within the province, and occupies 29,611 acres. This forest is situated between Brussels and Nivelles, commencing about 2 miles to the south of Brussels, and extending beyond the village of Waterloo, a distance of 8½ miles. The inhabitants are chiefly Walloons, who speak a dialect which differs from both the Dutch and the Flemish. The surface is level or rises into low hills. Much of it is covered with wood. The soil is fertile, and agriculture is in a flourishing state, the principal crops being corn, pulse, oil-seeds, flax, hemp, hops. The manufactures are numerous and flourishing, including cottons, linens, woollens, muslins, lace, carpets, velvet, leather, soap, &c. There are also numerous potteries, tanneries, hat, sugar, and coach manufactories, paper-mills, glass-works, distilleries, and breweries. It is well supplied with canals and railways. The province is divided into three arrondissements—Brussels, Léovann, and Nivelles. The capital of the province and the kingdom is Brussels.

BRACCIA NO, LAGO DI (the ancient *Sabatinus*), a lake in the Roman state, about 17 miles S.W. of Rome. It is of circular form, about 18 miles in circuit, and lies at the foot of the Monte Citorio. It is surrounded by hills, except to the south, where it borders on the wide unwholesome plain which slopes down to the sea. "To the south-east the lake has an outlet in the river Arno, which flows into the sea at Marorese. On its south-west bank are the castle and village of Bracciano. Besides Bracciano it has outcrops in Brignano (*Teuchimura*), Anguillara (*Angularia*), Vignello (*Vicus Aurelius*), San Stefano, near which are the ruins of several Roman villas. It gives rise to the river Arno (*Arno*), which falls into the sea about 8 miles north from the mouth of the Tiber. In its vicinity are thermal springs and baths. It is probably an ancient crater.

BRACCIO FORTEBRACCIO. See FORTEBRACCIO.

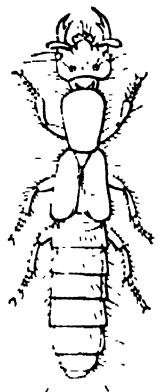
BRACCIOLI NI. See POGGIO.

BRACELET (Lat. *brachium*, the arm), a name given to an ornament worn round the wrist. When worn above the elbow it is named an armlet (Lat. *armilla*). Bracelets have been used from very ancient times. The oldest recorded notices of them occur in the Bible (Gen. xxiv. 30, xxxv. 18; Ex. xxxv. 22; 2 Sam. i. 10, &c.) A reference to these passages will show that they were worn both by men and women. Bracelets have been favourite ornaments of all nations, savage or civilized. The shapes of many at present worn have been copied from ancient Greek and Roman fashions.

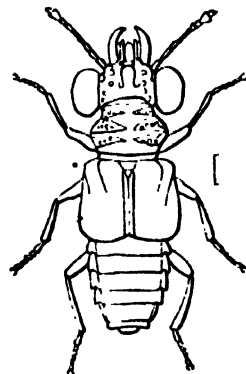
BRACHELYTRA is a group of BEETLES belonging to the section PENTAMERA, of which the common British insect the DEER'S COCK-SCAB (Oxyptus olens) is a good example. The distinctive characters of this group are a long, narrow, flexible body, and very short elytra, not covering the abdomen. The antennae are short, and are not, with few exceptions, thickened towards the end. The larvæ very closely resemble the perfect insect. The diversity in form presented by some of the members of this group

is shown in the subjoined figures, which are taken from Erichson's work. Some species even depart from the fundamental character of the Pentamera—viz. five joints in the tarsi. In some the anterior tarsi have only four joints; in others all the tarsi are four-jointed, while the family Pselaphidae approach the characters of the TETRAMERA in possessing only three joints in the tarsi.

The Brachelytra are carnivorous in their habits, occasionally feeding on decaying animal and vegetable substances.



Seytinus serpentinus.



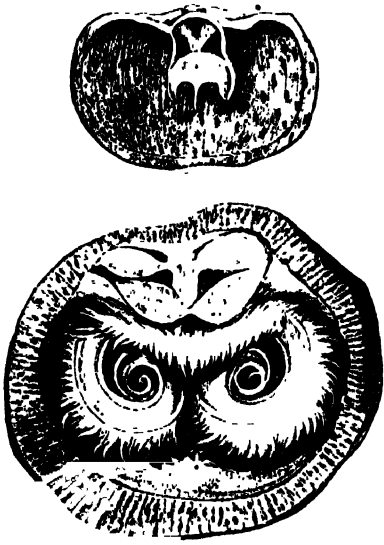
Megalops cephalotes.

They are found in carrion, dung, fungi, flowers, and mosses. Many species live in captivity in ants' nests. What particular service they render to their captors is not known, but it is supposed that, like the Aphides, they exude a liquid pleasant for food.

The Brachelytra are divided into the families STAPHYLINIDÆ and Pselaphidæ. The latter family forms a very aberrant group; the abdomen and elytra are much wider than in the Staphylinidæ, and the tarsi are always three-jointed. The antennae are frequently thickened at the end, and vary considerably in the number of joints.

BRACHIOPODA (*brachion*, arm; and *pous*, foot = arm-footed) is a class of MOLLUSCA possessing bivalve shells, but differing from the ordinary bivalves, such as the oyster and mussel (LAMELLIBRANCHIATA), in many important characters. The shell is symmetrical, but the valves are never exactly the same size. In some genera the shell is attached to submarine bodies by a muscular stalk or pedicle which passes through the beak. From the resemblance in the shape of the shell to a lamp, with the wicklike stalk, the Brachio-poda were called, "Lamp-pades" or "Lamp-shells" by the old naturalists, and this name is still frequently applied to a family of this class, the Tebratulatidæ. The valves, instead of being right and left, as in the Lamellibranchiata, are anterior and posterior. As the animal lies upon its back, the lower valve covers the back of the animal, and therefore is, with reference to the body, correctly called the *dorsal* valve; the upper, covering the ventral surface, receives the name of *ventral* valve. The dorsal valve is the smaller of the two, and is always free; the ventral valve, on the contrary, is usually the larger, and has a prominent beak, by which in some cases the shell is attached. In some genera the beak is perforated for the passage of the stalk. These valves are united by a hinge without a ligament, and are articulated by two curved teeth, which are developed from the margin of the ventral valve and fit corresponding sockets in the other. In a few genera the hinge and teeth are absent, the valves being held together by muscles. The shell consists of elongated and curved cells, matted together and often perforated by circular holes. In most cases it

is traversed by minute canals, which are considered by Dr. Carpenter to be subservient to respiration. The body of these molluscs within the shell is covered with a delicate mantle, lining the inside of the valves. This mantle is traversed by bloodvessels, and furnished, especially along its edge, with vibratile cilia. It is the chief organ of respiration, and from this circumstance De Blainville proposed the name *Palliobranchiata* ("mantle-breathers") for this class. The mantle aids also in the purification and circulation of the blood as well as in the repair of the shell substance. Internally the dorsal valve is furnished with a peculiar shelly apparatus, called by some authors the "apophysary system," and by others the "internal skeleton," and by collectors the "carriage-spring." "The principal part of the internal skeleton," says Professor Owen, "consists of a slender, flattened, calcareous loop, the extremities of which are attached to the lateral elevated ridges of the hinge. The crura of the loop diverge, but again approximate to each other as they advance for a greater or less distance towards the opposite margin of the valve. The loop then suddenly turns towards the perforate valve, and is bent back upon itself for a greater or less extent in different species. . . . The arches of the loop are so slender that notwithstanding their calcareous nature



Structure of Brachiopods.

they possess a slight degree of elasticity and yield a little to pressure, but for the same reason they readily break off if the experiment be not made with due caution." This extraordinary apparatus is intended for the support of the "fringed arms" of the animal. The mouth of the brachiopods is placed on the under part of the cavity between the lobes of the mantle. Developed from the sides of this mouth are two long appendages, which appear to be lateral prolongations of the lips, and correspond with the lips and labial tentacles of the ordinary bivalves. These have usually been called arms; and Cuvier, under the impression that they were used as organs of locomotion, gave the class the now somewhat misleading name of *Brachiopoda* ("arm-footed"). They are free or united by membrane, and are so long that they require to be folded up. In most of the species they are twisted in a spiral form, and their outer margins are fringed with long cirri or filaments, by means of which the animal creates a current in the water that brings objects of food within reach of the mouth. The arms also assist in the work of respiration. The mouth

conducts by a gullet into a distinct stomach, communicating with which is a well-developed two-lobed liver. In some genera there is a distinct anal orifice. The heart is a simple ventricle. The nervous system shows a very low state of development.

In the *Brachiopoda*, in most cases, both sexes are united in one individual. Nothing accurate is known respecting the development of the young, but they are believed to be, in their first stage, free and able to swim about until they meet with a suitable position. Some of them appear to attain their full growth in a single season, and all probably live many years after they have become adult. The species are all marine, and are found attached to branches of coral, hanging from the under side of shelving rocks, or abiding in the cavities of other shells. They are seldom found on clay beds; but where the bottom consists of calcareous mud they appear to be very abundant, mooring themselves to every hard substance on the sea bed, and clustering one upon the other (Woodward). The brachiopods enjoy a greater range both of climate and depth, as well as time, than any other mollusca known. They are found in tropical, temperate, and Arctic seas; in shallow pools left by the retiring tide, and at the greatest depths explored by the dredges; whilst in time they are found fossil in the Cambrian rocks. They attained their maximum in the Silurian epoch, which is therefore sometimes called the "Age of Brachiopods." In the Devonian and Carboniferous strata they are well represented. In the Secondary and Tertiary rocks they are less abundant. At present there are only between eighty and ninety recent species known, whilst of extinct forms nearly 2000 have been described.

BRACHMANS, a very ancient sect of philosophers or theologians in India, which still exist in Hindustan under the name of BRAHMAN, and retain many of the traditions and tenets of their ancient prototypes. With the Brachmans of India Alexander the Great had some singular conferences; and Arrian, the Greek historian, has given some curious particulars of their opinions and general manners. "They do not pay any tribute," he says; "they assist at public sacrifices; they are astrologers," &c. They held the Pythagorean doctrine of the metempsychosis.

BRACHYCERA is a division of DIPTERA including most of those insects to which the general name *FLY* is applied. The antennae are short, and consist of only three joints. In several families, including the gad-flies and soldier-flies, the so-called third joint consists of several joints more or less consolidated and not distinctly articulated, as in the division *XYMOPTERA*.

As might be expected in a division including most of the flies, there is great diversity in the habits both of the larvæ and of the perfect insects. Some of the larvæ are aquatic, living in stagnant pools; others are terrestrial, and live on vegetable and animal matter. Some again, like the larvæ of the bot-flies, are parasitic, living within the bodies of quadrupeds. The perfect insects lay both flowers and animals under contribution. As a rule the perfect insect of an aquatic larva feeds on the honey in flowers. The perfect insects of the terrestrial larvæ are either carrion-eaters, or prey upon other insects, or like the gad-flies suck the blood of animals.

• **BRACK'EN FERN**, or **BRAKE**, is a species of FERNS called by botanists *Pteris aquilina*. It is the most abundant of our British species of ferns. There is scarcely a wood, heath, or forest in the United Kingdom where this plant does not make its appearance. It is said to be indicative of poor soil, but it is more probable that its absence from cultivated ground is to be attributed to the effects of the hoe and the plough rather than to the quality of the soil. The geographical range of this species is very extensive; it is included in every European list, and is found also in Asia and Africa. It is used in many parts of England and Scotland for manure, and in the

Western Isles it is burned for the sake of the alkaline ashes which it yields.

The fronds are from 1 to 5 feet high, springing from the long black rhizome or root-stock; for some distance from the ground they are mere stalks, then they give rise to three bipinnate branches. The spore-cases are attached to the marginal vein, lying between two membranes, the one above being the reflexed margin of the frond.

BRACKETS, in algebra, are of extreme use. They serve to connect together all the quantities which they enclose, which therefore can then be dealt with as one quantity, and need not be realized or reduced till the close of the operation. Thus $(a + b)$ means the combined quantities, a and b ; so that $2(a + b)$ means not $2a + b$, but $2a + 2b$. Again, as in algebra the mode of subtracting quantities is to alter their signs (so that if we wish to take $+a$ from $+b$ we alter the sign of a to $-a$ and simply write $b - a$), brackets offer a great resource in this particular, enabling us to preserve the original signs of the quantities, which otherwise would be changed in subtraction. If it be desired to subtract $a + b - c$ from $x + y$, we can express the operation by writing $x + y - (a + b - c)$, whereas if we were not to use the bracket we must write as follows: $x + y - a - b + c$. It is easy to see that in complicated operations, what is not very difficult to follow in these extremely simple cases may, and generally does, become a source of much error if a judicious use of brackets be not made.

BRACKETS, in architecture, are those supports which are necessary for cornices, parapets, balconies, and other overhanging structures. For instance, there are two sorts of roof—that which projects from the wall with great eaves, and that which stops short, delivering its rain into a stone gutter which is supported by wooden brackets. This form of bracket occurs in later classical architecture with very beautiful effect. But it was the introduction of the parapet and balcony into architecture, mainly through the military requirements of the dukedoms, which gave the bracket its importance. In medieval fortification (such as the town walls of Avignon), a singularly perfect example of great extent of a great object to be secured was the power of standing over the heads of the attackers, so as to be able to pour molten lead or ball stones on them as they approached; and at the same time it was necessary to enlarge the space given by the top of the wall so as to afford room for walking engines, and for the massing of troops to contest an attack by scaling ladders. Brackets at once sprang into great usefulness, and from at first being simple stones built into the wall and projecting like wooden beams, they developed into three or four layers of such stones; or, if they remained in their primitive simplicity, were supported by wooden beams from lower down the wall, standing out sideways and catching their outer edge. From this to the use of a large stone or stones, the front face of which was level, and from the outer edge of the parapet back to the wall, was only a step. The bracket has developed into a highly decorative feature in architecture. It is often distinguished by the absurd ornamentation of curved volutes on the side, suggesting irresistibly the idea that it is stuck on to the wall; whereas, since the whole strength and use of the bracket depends on its being firmly set into the wall, the decoration of it, if there is any, should be such as to emphasize and bring out that construction.

Brackets are used in internal decoration as supports for statuettes and other decorative articles, but in this case the slight strength required is obtained by the nails, which should openly, and as a part of the design, fasten them to the wall.

BRACKLESHAM BEDS are a series of clays and marls, interstratified with lignite and gypsum beds, in the lower part, and with sands and pebble beds in the upper portion. They are of Middle Eocene age, constituting,

with the **BARTON** clay which lies above them, the middle **BAGSHOT** series. They extend across the Isle of Wight, from Alum Bay on the west to Whiteliff Bay on the east; they are best developed at the latter locality, where also they are fossiliferous and separated from the Barton clay by a bed of rounded flint pebbles about 6 feet thick. At Alum Bay the lignites are very conspicuous; they are formed of plants that decayed where they grew, not of drifted plants, their roots extending into the underlying clay, thus resembling true coal beds; the conglomerate bed is here only 18 inches thick.

The characteristic fossils are *Cardita planicosta*, pierced by boring shells, *Turritella multicauda*, *Turritella imbricata*, and *Nummulites lavigatus*. In Berkshire the series is represented by gray and white pipe-clays, and white and yellow sands with pebbles. They are fossiliferous at Bracklesham Bay, Sussex, and Barton in Hampshire. A few outlying patches of the beds occur about Bagshot in the London Basin.

BRACKLEY, a market-town in the county of Northampton, 18 miles S.W. from Northampton, and 68 from London by the North-western Railway, is situated on the south bank of the Ouse, which is here a small stream crossed by a bridge of two arches. There are two churches and a town-hall. Boots and shoes are made, and malting is carried on. Under a charter of 2 James II. it had a mayor, seven aldermen, and twenty-six burgesses; and these, until the passing of the Reform Act of 1832, when it was disfranchised, had the exclusive privilege of returning two members to the House of Commons. The population in 1881 was 2504.

BRACT, in botany, is the name given to a leaf degraded more or less in type, and intermediate between the foliage leaves and those which are specially modified to form parts of flowers, such as the petals. Ordinary bracts may be seen in the common meadow orchids, in which the large leaves at the base gradually change into smaller ones upwards, until they are quite small where the flowers spring; these are the *bracts*. In some flowers, as the wallflower and other crucifers, there are no bracts, and hence these flowers are said to be *bracteate*. In the willow there is a ring of bracts directly under the calyx, but generally a ring of bracts (*involucre*) incloses several flowers, as in Umbelliferae and Compositae. In the oak, Spanish chestnut, and beech the bracts harden to form the cup of the acorn, &c. Sometimes the bracts enlarge and rival corolla leaves in brilliancy of hue, e.g., in *Bougainvillea* and *Poinsettia*; and sometimes a single bract (*spathe*), as in *Calla* and *Ricelandia*, from its great size and beauty, forms a worthy object of admiration. The well-known cones which give the name to the Coniferae are composed of bracts, to the inner side of which are affixed the ovules. Bracts of a smaller kind are called *bracteoles*. They are generally more charged than bracts.

BRADFIELD, a town in the county of York, 170 miles from London, being 3 from the Oughty Bridge station of the Manchester, Sheffield, and Lincoln Railway. It was here that in 1864 the Dale Dyke reservoir of the Sheffield Water Company gave way, and occasioned great destruction of life and property. The population in 1881 was 1429.

BRADFORD, a large manufacturing town, parliamentary and municipal borough, and inland banking place, in the West Riding of Yorkshire, is situated about 8 miles W. of Leeds, and 196 miles from London by the Great Northern Railway. It stands at the head of a wide valley, along which flows a small tributary of the river Aire. Prior to the formation of the Bradford Canal, in 1776, this stream used to stagnate in a broad open space, which had to be forded; and hence the name of the town, *Brad* ("broad") *furd*. The surrounding country was naturally very picturesque, but it is now dotted with huge mills,

collieries, and foundries, and has all the appearance of one vast manufactory. Since the beginning of the present century Bradford has increased in size and population to a greater extent than any other town in Yorkshire. The population of the entire parish, which was only 13,264 in 1801, was 221,553 at the census of 1881.

The view from Peel Place, where stands the smoke-stained statue of Sir Robert Peel, is very fine. Great warehouses stretch away on every side, including many with good architectural elevations, very lofty, and giving an imposing idea of the wealth stored within. The houses are mostly built of freestone; the streets are generally narrow, but are well paved and lighted; and an abundant supply of water is brought to the town from a distance of more than 20 miles. The entire parish, which includes an area of 33,710 acres, is thickly peopled, and along all the principal roads leading from the borough there is a succession of towns and villages. Bradford is thus the centre of a busy manufacturing district; and it is still by far the most important as well as the oldest seat in England of the trade in spun and woven worsted stuffs and yarn, especially the latter. Woollen cloths and mohair and alpaca fabrics are made in considerable quantities, and cotton and silk are spun to some extent. Of course, the long wools and other raw materials for the above manufactures find a ready market here, being purchased by manufacturers from the whole clothing district. The first factory with a steam engine was erected in 1800; at present there are nearly 200 mills of different kinds, in which machinery is universally employed, and as a natural consequence the stream which flows through the town is now as black as ink. The scene in the streets when the "hands," about 40,000 in number, turn out at mid-day for dinner is very remarkable; and the noise made by their *clogs* clattering along the pavement is almost deafening. Much of the prosperity of the town is owing to the abundance of excellent coal and ironstone found in the neighbourhood, the beds being thickest in its immediate vicinity, and the pits from 200 to 600 feet deep. The iron-mines appear to have been known to the Romans, for several of their coins have been discovered here in masses of scoria, or foundry refuse.

The merchants and inhabitants of Bradford have displayed much liberality, spirit, and enterprise in erecting new and handsome public buildings, and improving the general appearance of the town. There are altogether about twenty churches in the borough, and eight of these have been erected since 1860 by subscriptions, the most worthy of notice being—St. Peter's; All Saints', Horton; Christchurch; and St. Andrew's: the others are not of great interest. St. Peter's, which is the old parish church, stands on the hill-side, and was originally built in the reign of Henry VI., but it has been restored. Its ancient oaken roof has only recently been again exposed to view. The best of the modern churches is All Saints', Horton, which is built in the Early Decorated style, and contains some good carving. Among the Dissenters, the Wesleyans and Independents have the most numerous places of worship; there are also Roman Catholic, Presbyterian, Unitarian, and Baptist chapels, the total number being about sixty; and a Friends' meeting-house. St. George's Hall, where all the large public meetings are held, was erected in 1853, at an expense of £13,000. It is a handsome structure, in the classic Italian style, and is surrounded by Corinthian pillars. The great hall is 152 feet long, 76 broad, and 54 high, and is capable of holding 3350 persons. The new Exchange, the foundation stone of which was laid by Lord Palmerston in 1861, is a fine building, Venetian-Gothic in character. It was built by a company, at a cost of £80,000, and was opened for the transaction of business early in 1867. The principal entrance is at the east end, and here a well-proportioned clock-tower rises to a height

of 150 feet. On the back angle of this tower are statues of Bishop Blaize, the reputed inventor of the art of combing wool, and the patron saint of the wool-combers (and whose festival is consequently kept with great fervour in the town), and of King Edward III., who granted a trading charter to Bradford. In 1873 a magnificent new town-hall was opened. It cost £100,000, exclusive of the site, valued at £40,000. The principal front, towards Market Street, is 275 feet long and 73 feet high, and the massive tower is 23 feet square and 200 feet high. The latter is not only used for ventilating purposes, but contains a great clock with four illuminating dials, and one of the finest peals of carillon bells in Europe, playing twenty-one tunes. The hours are struck on a bell of 4½ tons by a hammer of 3 cwt. The free grammar school of Bradford, the new premises of which were opened in 1873, was founded in the reign of Edward VI., and chartered and in part endowed by Charles II. The new Technical College, commenced in 1880, and opened by H.R.H. the Prince of Wales in 1882, affords the best artistic and scientific instruction in relation to the special industries of Bradford. The other principal public buildings are—the court-house, mechanics' institute, public library, temperance hall (the first temperance society in England was established in this town), the principal banks, several theatres and music halls, many of the finest warehouses in the world, numerous schools, a general infirmary, eye, ear and blind institutions, a luncheon for decayed tradesmen, working men's club-houses, &c. A market, which cost £15,000, was opened in 1872. In 1875 a Congregational college was erected at Horton, near Bradford, to replace Airedale College, erected at Undercliffe in 1831. The Wesleyans have a seminary (founded 1812) at Woodhouse Grove, for educating the sons of ministers; and at Rawden there is a Baptist's college. Bradford has also a philosophical society, and numerous charitable institutions. The Woodlands Convalescent Home, erected near the town by Mr. Ripley, was opened in 1877. It is built on the most approved principles, and has accommodation for 120 inmates. In 1869 a memorial to Richard Oastler was erected in an open space in front of the Midland Railway Station. It is in the shape of a statue of the persevering advocate of the "Ten Hours Bill," pleading the cause of the factory children, two of whom (a boy and a girl) are at his side. In 1870 Mr. S. C. Lister sold Manningham Park, an ornamental estate of 51 acres, to the corporation for £40,000 (scarcely two-thirds of its actual value, on condition of its being dedicated to the use of the public for ever. A handsome statue of him, raised by public subscription, was erected in the park in 1875. Peel Park is also a space of open ground, which has been well laid out. In 1872 the corporation purchased land at Horton for another park, 30 acres in extent; and two others have since been made, one at Bowling, and the other by the conversion of the waste land of Bradford Moor into a recreation ground.

Bradford was incorporated in 1847, since which it has been divided into eight wards, and governed by a mayor, fifteen aldermen, and forty councillors. The parliamentary and municipal limits are co-extensive. The population of the municipal borough in 1881 was 183,032, and of the parliamentary, 180,459. The borough, which consists of the townships of Bradford, Manningham, Bowling, and Horton, formerly returned two members to the House of Commons, but it was allotted an additional member by the Redistribution of Seats Act passed in 1885. Courts of quarter sessions, as well as county courts, are held here.

Bradford has little ancient history. It is mentioned in Doomsday Book, and in Saxon times it formed part of the parish of Dewsbury, but was afterwards included in the barony of Pontefract, which was in the possession of the

Laceys, who had a castle at Bradford. The last of the Lacey, Alice, married the Earl of Lancaster, and this town, with her other possessions, then passed into the family of her husband. In the civil wars of Charles I. it was Parliamentary, and after twice repulsing troops sent from the Leeds garrison, was taken by the Earl of Newcastle. The inhabitants had little to do with the "Luddite" disturbances of 1812; but in 1826 a determined opposition was made against weaving by power-looms, and some mills were then attacked and damaged, though, of course, the advance of machinery was not checked, and since that period the history of the borough has been one of uninterrupted prosperity.

The subject of the Bradford coat of arms is taken from an interesting legend of the time of John of Gaunt. The king is said to have offered a reward for the death of a wild boar that had become a terror to the villagers around. A youth slew it whilst drinking at the well, which is still known as the "Bear's Well," and cut out its tongue as a proof of his success. Another person, finding the carcass, cut off the head, and reaching the court first, claimed the reward; but as it was about to be conferred on him, the rightful claimant appeared with the tongue, which was found to be wanting from the head. The impostor was punished at this proof of his false pretensions, and the real hero received the reward.

On the Aire, about 3 miles from Bradford, is *Saltair*, a model manufactory and town upon a vast scale, founded in 1853 by the late Sir Titus Salt. The entire premises cover 12 acres, and the mill itself is 6 stories high, 550 feet long, and 50 feet wide. The whole building is fire-proof, and the walls are of immense thickness. Between 3000 and 4000 hands are engaged here in making fabrics of alpaca, mohair, &c.; and it is stated to be one of the best conducted establishments in the kingdom. The name of the settlement is a compound of that of the founder and the river on which the works are situated. In addition to the above spacious works, *Saltair* now contains a great number of streets, in which are some excellent dwellings for the workpeople, and various public buildings, including a church, two chapels, schools, a literary institute and club, baths and wash-houses, a gymnasium, an infirmary, and almshouses. In 1871 a park, 14 acres in extent, and laid out in an ornamental manner, was presented to the town by Sir Titus Salt, who congratulated the inhabitants that after twenty years' labour *Saltair* might be said to have been brought to a state of completion.

The iron-foundries and refineries of Low Moor and Bowling are also only a short distance from Bradford, on the Halifax Railway. Iron plates, bars, and railway tires, which are sent all over the world, are manufactured here in immense quantities; besides guns and some of the most ponderous works in cast iron. Altogether about 4000 men are employed at Low Moor; but at Bowling the works are not so extensive.

Between Bradford and Leeds are the splendid ruins of Kirkstall Abbey, which offer a striking contrast to the closely adjoining industrial sites.

BRADFORD CLAY, in geology, is a bed of pale grayish clay of Jurassic age. It is only locally developed in the south-west of England, and is about the same age as the Forest Marble or Bath Oolite; it contains some limestone and calcareous sandstone beds. The following fossils are found—*Apicrinites rotundus* and *Terebratula digona*. This clay attains its maximum development at Farleigh, where it is from 49 to 60 feet thick.

BRADFORD-ON-AVON, a market-town in Wiltshire, 30 miles N.W. from Salisbury, and 98 miles from London by the Great Western Railway, is situated on the N. bank of the Bristol Avon, which is here crossed by two neat bridges; one, the older, of nine, and the other of four arches. The town consists of three main streets, well built and

regular, on the acclivity of a hill. The Kennet and Avon Canal passes on the south side of the river, and there is also a station on the Great Western Railway. Bradford is one of the principal seats of the West of England cloth manufacture, and is the place at which kerseymeres were first made. The cloth manufacture is said to have been introduced by some Flemings in the reign of Edward I. There are also some manufactures of india-rubber goods, and extensive stone-quarries near the town. Bradford was of some repute even in Saxon times, and possesses what has been pronounced to be "the one perfect Saxon church in the country." This is the Saxon chapel of St. Lawrence, built by St. Ealdhelm, bishop of Sherborne, at the beginning of the eighth century, on the scene of the victory of his uncle Cenwealh, and mentioned by William of Malmesbury in illustration of his remarks on the progress of architecture in this country. The building was purchased by subscriptions from archaeologists and others, and restored in 1873. The parish church is spacious, with stained-glass windows, and has been thoroughly restored. There are several places of worship for Dissenters, a fine new Gothic town-hall, almshouses, a workhouse, and an endowed free school, where sixty boys are educated. Population, 8259. There is much picturesque scenery along the windings of the river and the dells of its wooded hills, and many fine old mansions. Bradford sent members to one Parliament in Edward I.'s reign, but never since; nor is there any record of its having ever been incorporated.

BRADING, a small town in the Isle of Wight, is situated on the slopes of two opposite hills on the S.E. side of the island, and consists chiefly of one long street. Several of the houses are ancient, and built of bricks supported by timber framework. The town-hall is a small structure. It has a market-house underneath, but no market is now held. The church is large, and of considerable antiquity, the style being chiefly transitional Norman. The Oglander Chapel has recently been carefully restored; it contains an ornamental brass, dated 1441, and some memorials of high interest. The Rev. Legh Richmond, well known for his popular religious works, held the curacy here for some time. Brading, notwithstanding its present insignificance, is an old corporate town. Brading Haven admits small vessels when the tide is up. Sir Hugh Middleton attempted to reclaim it from the sea by constructing a dyke, for which purpose he brought over workmen from Holland, but the water broke in, and the attempt was never afterwards resumed. The head of the haven is now traversed by the railway from Ryde to Ventnor. The population of the parish in 1881 was 7952.

BRADLEY, JAMES, the third astronomer-royal, was born at Sherborne, in Gloucestershire, in 1692. He entered Balliol College, Oxford, in 1710, and took the degrees of B.A. and M.A. in 1714 and 1717. In 1718 he became a fellow of the Royal Society. In 1719 he was ordained to the rectory of Bridstow, in Monmouthshire. In 1720 he obtained another living, but in 1721 resigned his preferments on obtaining the Savilian professorship of astronomy at Oxford, with the holding of which they are incompatible. We find him now engaged in miscellaneous observation, particularly with the long telescope introduced by Huyghens. With one of these, of 212 feet focal length, he measured the diameter of Venus in 1722. In 1725 Bradley began the observations which led to his great discovery of ABERRATION, with Mr. Samuel Molyneux at Kew, in the house which afterwards became the palace of that name. Bradley and Molyneux detected the motion of α Draconis and other stars, and established approximately the law of the motion of the first. That the motion in declination depended in some way or other on the latitude of the star was evident, and in this state the matter stood, when Bradley, in 1727, having lost his condjutor (who had become the first lord of the Admiralty), began observations

at Wanstead with a better instrument than that at Kew, and capable of taking in a larger range of the heavens. He soon confirmed the general fact which he had observed, and it only remained to assign the cause. There is traditional evidence to the following anecdote, first given by Dr. Robison:—"He accompanied a pleasure party in a sail upon the river Thames. The boat in which they were was provided with a mast which had a vane upon the top of it. It blew a moderate wind, and the party sailed up and down the river for a considerable time. Dr. Bradley remarked that every time the boat put about the vane at the top of the boat's mast shifted a little, as if there had been a slight change in the direction of the wind. He observed this three or four times without speaking; at last he mentioned it to the sailors, and expressed his surprise that the wind should shift so regularly every time they put about. The sailors told him that the wind had not shifted, but that the apparent change was owing to the change in the direction of the boat, and assured him that the same thing invariably happened in all cases." By tracing this phenomenon to its cause, namely, the combined motion of the boat and the wind, he was enabled to give the solution of the star's motion, namely, a small change of place arising from the spectator giving to the ray of light the effects of his own motion, as explained in the article **ABERRATION**. This discovery was the first positively direct and unanswerable proof of the earth's motion.

In 1728 Bradley began lectures at Oxford, and in 1732 removed his residence to that university. Various labours sustained the character of the "best astronomer in Europe," given to him by Newton, until the year 1742, when he was appointed astronomer-royal. From this time to 1747 he was engaged, among other things, in the career of observation which led to his second great discovery of **NUPTATION**, communicated in that year. Briefly stated, this is to the effect that the earth's pole moves not round an imaginary regular cone, as Newton had explained in his great theory of the **PRECESSION OF THE EQUINOXES**, but round a *fluted cone*, each flute taking nineteen years to pass; so that observations were only absolutely accurate every nineteen years, and at all other times needed correction for nutation. This seemed so inconsistent with the theory of gravitation, that Bradley dared not break it to the aged Newton. Molyneux undertook the task with fear; but Newton simply said, "It may be so; there is no good arguing against facts and experiments," an answer always considered remarkable for his faithful courage.

There is a third investigation of Bradley's which stands out from the rest, and displays considerable mathematical sagacity; we refer to his empirical formula for the law of refraction. He was assisted in the necessary computations by Maskelyne, who first appeared before the world as the pupil of Bradley. In this very delicate research the latter had again gone beyond his contemporaries in the evaluation of minute quantities.

In 1751 the alteration of the calendar to the New Style took place, and Bradley had some share in drawing up the necessary tables. But this procured him some unpopularity, for the common people imagined that the alteration was equivalent to robbing them of eleven days of their natural lives, and called Bradley's subsequent illness and decline a judgment of Heaven. He died at Chalford, in Gloucestershire, in 1762.

It may be said that Bradley changed the face of astronomy. The discoveries of aberration and nutation and the improvement of the tables of refraction, the attention to minute observation and the tact with which every instrument was applied to the purposes for which it was best adapted, were so many great steps both in the art and science. Before his time every instrumental improvement was a new cause of confusion, by pointing out irregularities which disturbed previous calculations.

BRADSHAW, JOHN, president of the court which tried Charles I., was born in Cheshire, of good family, in 1586. When young, he was a student of law in Gray's Inn. In 1614 he was employed by the Parliament to prosecute Lords Macquire and Macmahon, the Irish rebels. In October, 1646, by a vote of the House of Commons, he was appointed one of three commissioners of the Great Seal for six months; and in February following, chief justice of Chester. On 14th January, 1648-49, an ordinance was passed for erecting a high court of justice for the trial of the king, and the commissioners for the trial elected Bradshaw their president. How he filled that office is well known, and the Parliament was lavish of its rewards to him for his services on that occasion. He was made president of the Council of State, &c. When Cromwell seized the government Bradshaw was one of those who offered all the opposition in their power, and never went over to him. He even engaged in plots against the Protector, though he sat in his first Parliament, and accordingly he was deprived of his office of chief justice of Chester. On the death of Oliver, and the abdication of his son Richard, Bradshaw obtained a seat in the Council of State, was elected lord president, and appointed a commissioner of the Great Seal; but his health became so precarious that he was unable to perform the duties of that office. He died 22nd November, 1659, of a quartan ague, which had lasted a year. He was buried with great pomp in Westminster Abbey, whence his body was dragged at the Restoration, to be exposed upon a gibbet with those of Cromwell and Ireton.

BRA'DY, NICOLAS, a divine whose name is known chiefly, in connection with that of Nahum Tate, as the author of the new version of the Psalms of David, which has since become generally used in the Church of England, was born in 1659, at Bandon, county of Cork, and died in 1726.

BRAEMAR, a wild and mountainous district in the south-west of Aberdeenshire, lying in the heart of the Grampians, in the midst of the most beautiful scenery in Scotland. The country around is a region of deer forests, in which the red deer abound. Braemar is celebrated, in addition, for the great assemblies held in front of Braemar Castle to perpetuate the ancient Highland customs and games. The castle is a plain structure built in the last century to overawe the Highlanders. At a short distance is Castleton of Braemar, where there is the site of the ancient castle of Braemar, which is attributed to the age of Malcolm Canmore. Here also the Earl of Mar raised the standard of revolt in 1715.

BRAGA (the *Braccara Augusta* of the Romans), capital of the Comarca of Braga in the Portuguese province of Entre-Douro-e-Minho, stands on an eminence in a valley watered by the Deste and the Cavado, about 16 miles distant from the sea, and has 20,000 inhabitants. The city is ill built, with narrow irregular streets. It is the seat of an archbishop, primate of Portugal, and is surrounded by old walls and defended by a citadel. Before the conquest of Lisbon it was the residence of the Portuguese court. It has a fine Gothic cathedral of the thirteenth century, archbishop's palace, several monasteries, and some fine Roman remains. There are manufactures of iron wares, hats, shoes, linens, and jewelry.

Braga is a very ancient city, its foundation being ascribed to the Carthaginians. Down to a recent period it had the ruins of a Roman amphitheatre and aqueduct, but these are now nearly obliterated, and it possesses few memorials of its ancient grandeur, except some coins, found in the vicinity, and some Roman millstones. About 1½ mile E. from the city, on a hill, is the renowned sanctuary *do Senhor Jesus do Monte*, annually resorted to by crowds of pilgrims. The valley in which Braga stands is one of the most fertile in Portugal, and is covered with vines and orange plantations.

BRAGANZA, the capital of the province of Tras-os-Montes, and the original seat of the royal house of Portugal, stands in a fertile plain on the Fervenza, a feeder of the Sabor, and has 6000 inhabitants, who manufacture taffeta, velvet, and other silk fabrics. The city, which is partially fortified and defended by a citadel, is the residence of the Bishop of Braganza and Mianda, and has two churches and a college. It was erected into a duchy in 1142; and in 1640 John II., eighth duke of Braganza, ascended the Portuguese throne under the title of John IV.

BRAGI, the Norse god of poetry and music, son of Odin, and one of the twelve supreme gods whose homes were in ASGARD (the Norse Olympus), rose upon the waves from the depths of the sea. All nature rejoiced at his coming, and the blooming Iduna, goddess of youth, married the divine bard. Hand in hand they climbed to ASGARD, where Iduna's pleasant task was given her; namely, to land the gods every morning the apples of youth. When the "twilight of the gods" overtook the divine Ases because of Loki's treachery, and sin came into the world because of their broken faith, Iduna fell from her bright seat amongst the boughs of YGGDRASIL, the ash-tree which enfolds the world, down amongst the gloomy depths where hide its roots. With her fell Bragi; for when youth and innocence have fled, joyful songs have no longer a home amongst gods or men.

BRAHAM, JOHN (really Abraham), a celebrated tenor singer, was born in London of Jewish parents in 1771, and died 15th February, 1856. He first appeared upon the stage in 1787, when he sang at the Theatre Royal, Covent Garden, and he continued to perform until within a few years of his death. In energy and pathos of style he stood univalued as a public singer, and his powers in this respect were especially conspicuous in accompanied recitative. As a singer of national and patriotic songs, he also enjoyed immense popularity, and his most successful efforts in this direction were made in connection with songs of his own composition. Of these the best known is "The Death of Nelson," which is still a favourite. Braham was not only exceedingly popular in England, but he performed with great success at Paris in 1797, at Florence and Milan in 1798, and at Venice in 1799. He was nearly less famous as a composer than as a singer; his fond of anecdote and varied information made his society sought after with eagerness by the best circles.

BRAHÉ, TYCHO, the astronomer, rendered services to astronomy second only to those of Copernicus himself, whom he followed at the distance of three quarters of a century. Copernicus was born in 1472; Tycho Brahé was born in 1546 at Knudstrup, on the Fohle's meastral estate, near Helsingborg in Denmark. The contrast between these two men is most curious. Copernicus was almost of peasant origin, Brahé was a noble; the first was poor, the second rich. The German was a solitary, meditative, and fastidious man; the Dane loved company, travel, and fierce sports and the beliefs. In one point they were alike, "the agony for taking infinite pains," which Dr. Johnson says is the mark of genius.

First, as to Tycho, his uncle was childless, and went to the extreme measure of stealing his nephew as a son, as neither son was born to Tycho's father. In consequence of this arrangement, which was accepted after some quarrel, Tycho received a good education, instead of at once training for military pursuits, like the other young nobles of his day. But his father only consented to his following the degrading pursuit of knowledge, fit for monks and such poor cattle, on the representation that his Latin and his reading and writing might stand him in good stead when he was old enough to take part in the government. When Tycho was thirteen he was sent to the University of Copenhagen, and there, an eclipse of the sun happened, and closely fulfilling the predictions of the

astronomers as to its date, duration, &c., his attention was aroused; and the love of the marvellous, which always characterized him, led him to study the means whereby such extraordinary accuracy of prediction was attained. In 1562 he went to Leipzig with a tutor to study law; but his real study, to which his leisure and often his nights were devoted, and on which he spent all his money allowance, was astronomy. He discovered that the ALFONSINE TABLES were in error by a month through the lapse of time, because being somewhat inaccurate (for they were founded on the Ptolemaean system of cycles and epicycles) their errors increased every year. Tycho Brahé worked out by the Alfonsine tables a conjunction of Jupiter and Saturn which he had observed, and found this great discrepancy between the reckoning and the observation. He firmly believed that the plague which raged at this time was caused by the meeting of these two planets, and this was only in accordance with the errors of his age. Later in life his countless observations showed him that the stars have no control over earthly things, and he reflected that two men born in the same place at the same time, and therefore with the same horoscope (or star-map of the instant of birth), usually had, as a matter of fact, widely different fortunes. As this was contrary to the plain teachings of astrology, he chose between fact and fancy in favour of the former, and he quite freed himself from this then almost universal superstition before he died. His great interest in astrology as a youth was, however, of benefit to science, for it led him closely to watch the above-named conjunction, and so to detect the inaccuracy of the Alfonsine tables. He at once saw a work before him worthy the living for—viz. the collection of a mass of accurate observations whereon to construct true tables. He considered, further, that Copernicus' system was not a true explanation of the universe—indeed, it was not so as Copernicus left it, although it needed but little emendation to make it so—and consequently all was yet dark, and the first thing necessary to the obtaining of light was an immense collection of facts. From these, he divined with the eye of genius, the truth must ultimately emerge. He was still working with rude instruments made by a carpenter when the death of his uncle and guardian left him in affluence (1565), and able to devote money and time entirely to his favourite pursuit. This led to a violent quarrel with his family, who considered his work as a bitter degradation to their rank, and he left Denmark altogether.

He went first to Wittenberg in Germany, and thence (when the plague broke out there fiercely) to Rostock. Here, upon some point of mathematics, he quarrelled with a brother Dane and mathematician named Pasherg, and the dispute grew so fierce that it came to a duel with swords in the dark. The result was that Tycho Brahé lost his nose by his adversary's swordplay. He constructed a false one of metal—some say of gold, some say of brass—enamelled to a flesh tint, and fastened by cement to his face. This periodically came off, and he always carried with him the ointment necessary to be applied on that catastrophe occurring. To judge by the importance given by all his biographers to this false nose, it was the admiration of the age—indeed, it appears to have called forth more popular applause than all his truly valuable observations.

At Augsburg, whither he removed in 1569, Tycho Brahé met with a kindred spirit—Hainzel, the burgo-master—who had set up in his garden a huge quadrant, graduated down to minutes of a degree, for taking altitudes, and a sextant to match for observing angular distances. With these instruments Tycho Brahé made a large number of very accurate observations during a space of two years.

His fame was now great, and his family saw with astonishment that science was an honourable pursuit in no wise derogatory to a noble. They therefore invited him to return to Denmark in 1571. His uncle gave him a house and appliances, and he added a vigorous pursuit of

alchemy to the observations which he still continued to take without remission. But a fiercer feud than ever broke out with his relatives when he married a peasant girl of his native village of Knudstorp in 1573, and the king himself with difficulty composed it. Henceforth Tycho Brahé, happy in his wife and his science, perceived the nonsense of the prejudices which had environed himself as well as his family (as when, for instance, he refused to lecture publicly because it was beneath his rank), and directed the fiery energy of his fierce nature to the destruction of such pernicious ideas with all the zeal of a convert. At the same time his lovely and amiable peasant-wife drew him near to the lower classes of society, and he lived in relations of great tenderness and beauty with the poor people to whom he delighted to play the part of benefactor. He next visited, in pursuit of his observations, the astronomical Landgrave of Hesse-Cassel, whence he journeyed to Venice, to Ratisbon, and other places, finally selecting Basel as the fittest position for an observatory. But before he had begun his arrangements he was summoned back to Denmark by the king, whom the Landgrave of Hesse-Cassel had at last made aware of the immense genius he was allowing to escape from Denmark. Frederick II. gave Tycho Brahé the island of Hven, 11 miles from Copenhagen, £400 a year for life (besides other property), and £20,000 wherewith to build an observatory. Tycho Brahé, who was nothing if not princely, at once added £20,000 of his own, and the famous *Uraniberg* (or "city of the heavens") was built. It lay on a hill, within a square wall of 300 feet to the side, the angles pointing N., S., E., and W., with a belt of garden within the outer wall filled with chosen varieties of trees. The inner building had two observatory towers filled with delicately graduated scales and the best instruments of that early time, and ornamented with pictures and statues of astronomers. The servants, &c., were lodged in buildings along the outer wall. For twenty years Tycho Brahé worked uninterruptedly in this splendid temple of science; and not only he, but a crowd of ardent young disciples, amongst whom the peasant ciphered side by side with the noble—an unheard-of thing! Tycho Brahé at this time was intellectually the monarch of Europe, and most of the royal families of the time found ways to visit Uraniberg. Here, to their astonishment, the peasant-wife of the great astronomer received them, and her husband, if he suspected them of wasting his time out of mere curiosity, showed them ingenious trifles of clockwork toys, &c., declining to admit any but true lovers of science into his instrument rooms. In 1588 the king died, and his successor did not forget how the astronomer had laughed at a royal blunder of his. Other enemies of the fiery little man with his false nose and his irritating democratic crazes (as they seemed to them) were not wanting. His pension, the estate given him by Frederick II., his canonry, were all taken away, and in 1597 he had to leave his splendid Uraniberg for lodgings in Copenhagen. A commission appointed to examine his labours pronounced them worthless! Perhaps it is as well to add that not one of the members knew one fact of astronomy. He was even attacked in the streets. He therefore crossed to Germany, and after some travels was invited by the Emperor Rudolph II. to settle in Austria. Eventually he accepted the offer, and received for an observatory a handsome castle at Banach, 20 miles north of Prague in Bohemia, with a liberal pension and estate. Here he lived over again his splendid life at Uraniberg—working, teaching his observers, tending his poor, laughing at the proud; but he felt keenly the ingratitude of Denmark, and became somewhat melancholy. He died in 1601, incessantly murmuring in his last moments, *Ne frustra vixisse videar* ("Let me not seem to have lived in vain").

This strange life and stranger character would rather cause us to expect brilliant theorizing than patient counting

of minutes and seconds. But the latter, and not the former, was Tycho Brahé's work. He left a catalogue of the exact positions of 1000 stars, *still absolutely faultless!* He also left a countless multitude of observations, of perfect accuracy, of the positions of the planets during twenty years, and observed and calculated the annual equation, &c., of the moon. No observation of all these many thousands has ever been found a *minute* (the sixtieth part of a degree) from the truth. We may say that no one did more for astronomy than Tycho Brahé, for he was the first accurate observer who ever set to work patiently to accumulate facts. His last act was amongst his greatest benefit. On his death-bed he chose out JOHN KEPLER, his favorite disciple, to complete and correct his tables of the planets. They were published by Kepler as the "Rudolphine Tables," and upon these wonderfully accurate tables of Tycho Brahé Kepler built up those glorious theories which have given him rank next to Newton himself in the history of the sciences.

BRAH'MANISM, the name given to a system of religion which has prevailed in India from a very remote period, and which at the present day retains its hold on a larger portion of its population than any other.

The religions of India, their origin, history, and philosophy, have now for many years received the attention of the earnest band of European scholars; but they form a subject of such vast extent that although much progress has been made in the study, many points still remain obscure and uncertain. This is especially the case in connection with the system of Brahmanism, and much of its history and many points of its philosophy are at present awaiting further investigation. It has, however, been clearly established that though this system is one of very great antiquity, it is not the earliest of the forms of religion of that country, but that it was preceded by the Vedic, of which it is a development. The religion brought in to India by the early Aryan settlers there appears to have been of a pantheistic character, though adoration was paid to many separate deities who were supposed to rule the forces of nature observed in the heavens and the earth. This is clearly displayed in the earliest collection of writings regarded as sacred by the Brahmans—viz. that of the *Rig Veda*. This is made up of a series of hymns or sacred songs of various lengths, from one to over fifty verses, of which over 1000 are included in the collection. They invoke a worship under the names of Indra, Mitra, Varuna, Ishta, Agni, &c., the deities of the sky and earth, the sun, the moon, the dawn, the storm, the wind, fire, and the intoxicating juice of the Soma or moon-plant, which was credited with wondrous properties, and believed to give power to the gods. These hymns were composed by a class of men who were called *Rishis*, a name which had a very simple meaning to that of seer or prophet as in the ancient Hebrews. The period during which these hymns were composed cannot at present be ascertained with any degree of certainty. Dr. Haug places it as far back as 2400 B.C., Professor Whitney between 2000 and 1600 B.C., and Professor Max Müller between 1500 B.C. and 1200 B.C. Whenever they were composed, the practices of offering sacrifices and of adoration by prayer and praise entered largely into private and public worship, and gradually there appears to have grown up an elaboration of rites and ceremonies which necessitated a separate priestly and sacred class. To the men whose gifts enabled them to compose the sacred hymns, and to those who were devoted to the celebration of worship, the name *brahmins* (from *brahma*, prayer or worship) was given, the name *Brahma* becoming afterwards the name of the mystic or all-pervading essence of the universe. At this period the people of India were already divided into classes; and while differences of rank and occupation divided the Aryan settlers, these were all further separated by colour and race from the original dark-skinned inhabitants of

India which they had supplanted and conquered. It is probable that among the Aryans the soldiers, or the families in which military service had become hereditary, were at first in the ascendant; but when the priestly class became firmly established a struggle for supremacy ensued, in which the Brahmins gained the victory. One of the results of this struggle was the fixing of the divisions of society that had arisen, and the binding up of this division with the religion of the people, forming the system of caste which remains to this day. In support of the influence of the priesthood a story was invented to the effect that caste dated from the creation of the universe. It was declared that when the universe was created by the All-supreme Existence the waters were first formed, and in them was deposited a seed. This grew into a golden egg resplendent as the sun, in which the Deity himself became manifest as "Brahma, the Creator of all the Worlds." This egg "he divided in two by his mere thought," forming the heavens and the earth from the two shells, placing in the middle "the sky, the eight regions, and the eternal abode of the waters." Furthermore, he had created man out of his own body, the Brahmins from his head, the Kshatriyas (or warriors) from his arms, the Vaisyas (farmers and traders) from his thighs, and the Sudras (the original, but now the subject race) from his feet. In addition to this theory of the creation, it was further declared that the sacred writings revered among the people were to be in the exclusive care of the Brahmins. To the original collection to which reference has been made there had been added the Sāma-Veda, or Veda of Chants, a collection of verses from the Rig-Veda, to be chanted at the Soma ritual; the Zajur-Veda, or Veda of Sacrificial Formulas; and the Atharva-Veda, or Book of Incantations. To each of these four text-books there was added a collection of comments and explanations in prose, the sacred text being termed the *Saṁhita*, and the explanation the *Brahmana*, the whole being regarded as of divine authority. All knowledge of these books was forbidden to the members of the lowest caste, and though the members of the higher castes were permitted to read them they might only be taught or explained by the Brahmins.

A code of laws, partly social and partly religious, known as the Institutes of Manu, was also compiled, by which the order of society and the rules of public worship were regulated. Severe penalties were denounced against all who should transgress against the sacred laws of caste, and laws were laid down to regulate diet, clothing, education, marriage, and everything pertaining to daily life. It would appear that the ascendancy of the Brahmins was not fully established for a long period, nor that it was maintained without severe struggles. The yoke they had laid upon the shoulders of the nation had begun to press very heavily when Buddha arose, and among the causes of his wonderful success must be placed the prevailing feelings of discontent with the Brahmanical system. Certainly the new faith prevailed for a long period over the old. It became the national religion about 200 years before the Christian era, and maintained its ascendancy for 500 or 600 years afterwards. Then, from causes at present unknown, it declined in power, and Brahmanism in a modified form came again to the front, and with the disappearance of Buddhism became once more the chief religion of India. Of this later Brahmanism, its theology centres around the deities Brahmā, Vishnu, and Siva, who together form the Hindu trinity. Of the legend concerning the first of these an account has already been given. At one period he seems to have been the object of general worship, but as the other deities grew in the popular imagination his worship declined, until at the present day he has but one temple in all India devoted to him. Regarded simply as the creator, he is supposed to take no interest in the universe he has created, and devotion is paid rather to the deities of preservation and destruction, upon whom so much is believed

to depend. His image is frequently placed in the temples devoted to other deities, and he is usually represented with four heads and as many arms. In one hand is placed a manuscript of the Vedas, in another a pot for holding the water used in purification; the third hand holds a rosary, and the fourth a sacrificial spoon.

The origin and growth of the ideas concerning Vishnu and Siva have not yet been traced, but to the first of these is given the office of preserver, and to the second that of destroyer. Concerning Vishnu it is taught that he has descended from time to time under various forms to deliver the gods or mankind from impending evils. These descents are termed *avatars*, and of these the favourite stories are those which cluster round his appearance in the persons of *Krishna* and *Rama*, and which are recorded in the two epic poems of the *Mahābhārata* and *Rāmāyana*. This was the eighth *avatar*, and while some regard the ninth as having taken place in the person of Buddha, others regard it as being yet to come, though all agree that the tenth will be the last, and will mark the end of the present universe.

Siva, the third deity of the trinity, is worshipped chiefly from fear. To his influence are ascribed the floods, famines, earthquakes, storms, and death. Other attributes are given him in addition, but it is chiefly as the destroyer that he is revered. In addition to these, the great gods, there are many other deities that receive homage, while the lesser divinities are too numerous to count. In the worship prescribed by Brahmanism there is an immense amount of elaborate ritual, and almost every act of daily life has its corresponding devotion. In all public worship, and on all special occasions, such as marriages, the birth of male children, and at death, the services of the sacred Brahman are essential. Regarded with awe as a being of mysterious sanctity, invested with the power of expounding and teaching the sacred Vedas, exercising the office of priest and spiritual guide, the Brahman was formerly everywhere held in the highest honour. At the same time he was expected to live in accordance with his sacred birth. To rightly accomplish his destiny he was required by the system to divide his life into four stages, and beginning with the study of the sacred books and the ceremonies of religion, to become successively a householder, a hermit, and a religious mendicant. His whole life was to be under careful regulation in all matters concerning food, drink, marriage, contact with others, &c., and severe penances were required of all who transgressed the laws of caste. Theoretically, similar duties were laid upon all save those of the lowest castes; but, as in many other systems of religion, the theory and practice have many points of difference. Very few either among the Brahmins or those of other castes seek to keep the letter of the law, and there are not wanting significant signs of the decline of Brahmanism as a system of religion. Among the cultured and educated Brahmins various schools of philosophy have arisen, and most of the problems that have occupied the Western mind have also been considered and debated by Hindu philosophers with much ingenuity. Thus while the mass of the people have remained sunk in ignorance and superstition, mental activity and theological and philosophical speculations were pursued by those to whom they looked up as guides. But both classes alike have felt the influence of European thought and European customs. As the young men of the higher castes have come under the influence of Western thought, so their old notions have disappeared; and though many of them do not accept Christianity, their Brahmanism loses much of its hold upon them. Among the common people the influence of European ideas prevails to a lesser degree, but that influence is nevertheless gradually increasing. Mohammedanism also, with its monotheistic creed and single sacred book, gains many converts yearly from Brahmanism. Finally, from within the ranks of Brahmanism itself there have arisen men who, laying aside its

superstition and mythology, have striven to bring about a reform both in its worship and its morality. For an account of one of the most recent of these movements see BRAHMO SOMAJ.

**BRAHMAPUTRA, BRAHMAPOOTRA, or BUR-
RAMPOOTER**, one of the largest rivers of Asia, and in many respects one of the most remarkable on the globe. Its most distant source, known as the Sanpu, is in Tibet, deriving its waters from the great glaciers of the Himalayas near the Lake Mansarowar, in about 30° 30' N. and 82° E. After flowing along by the E. passes of the Himalaya Mountains it enters British India in Assam, where it meets with that river which the natives of India have honoured with the name of the Brahmaputra, as the principal source. This rises in a valley called the Brahmakunda, on the eastern extremity of the Himalaya Mountains, in about 28° N. lat. and 97° E. lon.; it has a course of about 200 miles only, whilst the Sanpu has a course of fully 1000 miles from the N.W. The united stream flows through Assam, forming many small islands by divisions of its channel. It is here an impetuous and almost unnavigable river, and receives many tributary streams, among which are the Dupha Pain, the Kundil, and the Dihong. The Brahmaputra continues its course, changing its direction frequently, forming numerous small islands, and receiving many tributaries. It passes near Sudiya in Upper Assam, and at about 94° E. lon. it divides into two branches so wide apart as to encircle an island (Majuli) 50 miles long by 9 in width. Flowing E. until it reaches about 96° E. the river turns W.S.W. past Godpara, and enters the plains of Bengal.

Here the Brahmaputra is about 1200 yards wide, with a very rapid current. It flows past Rangamatty and Fringyabazar, receiving in its course the waters of the Bonash, the Barak, and many other rivers. At about 25° N. lat. a cross channel connects it with the Ganges. Below Fringyabazar the Brahmaputra becomes so intermingled with the Ganges that the two rivers may be said to flow together to the Bay of Bengal, or rather the eastern mouth of the Ganges is nearly identical with the main mouth of the Brahmaputra. By their united influence they have cut up their common delta into many portions. The channels forming these change very frequently.

The course of the Brahmaputra, from its most distant source in Tibet to its mouth in the Bay of Bengal, is about 1800 miles in length; but from the river rising in the valley of Brahmakunda it is 900 miles only. The river is known by various names, according to the countries through which it flows. In Tibet it is called the *Tanyam Khamba* ("Horse's Mouth"); in Assam, the *Hiranga* below its junction with the Ganges, and *Jamuna* above. The Indian name Brahmaputra signifies "Brahma's offspring." A strong bore frequently occurs in the passages of the delta formed by the united streams of the Brahmaputra, Ganges, and Meghna.

BRAHMO SOMAJ ("the Church of the One God") is the name of a religious body of theists in India which seems destined to effect a great influence on the future of that country. The history of this theistic movement naturally falls into three periods—the first mainly consisting of the personal labours of its originator, the Rajah RAMMOHUN ROY, for the enlightenment of his countrymen, and culminating in his establishment of the Brahmo Somaj in January, 1830, shortly before he left India for England, where he died in 1833. After this time, however, the Somaj languished for several years, but in 1842 it entered into a second period of life under Debendro Nath Tagore, who converted this body of worshippers into an association of believers by binding them to a few articles of belief, and to a covenant enjoining moral purity of life. He also started a religious journal, appointed teachers, and published several doctrinal and devotional treatises. Up to this time the Vedas had been regarded by the successors

of Rammohun Roy (though not by the rajah himself) as the sole foundation of their belief; but when a thorough investigation of these had shown that although they contained much that was admirable, on the other hand they inculcated pantheism, transmigration, and annihilation of the soul, Debendro Nath Tagore, to his eternal honour, threw them aside as the standard of faith, and bade farewell to Vedantism. Falling back on the book of nature and intuition as the basis of their faith, a work was issued in 1850, entitled the "*Brahmā Dharma*" (i.e. the "*Religion of the One True God*"), a compilation from the Hindu scriptures, which is still used as the principal text-book of Brahmoism. Its main points are—the existence of one supreme and perfect God, "the One without a second," "a distinct personality," but never incarnated; the conscious immortality of the human soul; the efficacy of prayer for spiritual blessings, and of repentance as "the only way to atonement and salvation." No scriptures are held to be infallible, but the religious truths taught in all are equally accepted.

During the years 1847–58 the Brahmo Somaj made considerable progress; hundreds of followers were enrolled, and branch Somajes were established in different parts of Bengal. But the external life of its members varied but little from that of their polytheistic countrymen, many Brahmos even conforming to all the degrading sacraments of idolatry. At last this anomalous state of things was broken up by a new influence. In 1859 an enthusiastic and energetic youth of more than ordinary talents joined the Brahmo Somaj. He had previously established a society for the cultivation of religious feelings. At this society he used to deliver sermons extempore in English. This youth, by his devoted zeal and untiring energy, gained for a time a great ascendancy in the Brahmo Somaj. He was very eager to carry into practice the various reforms which the Brahmos had been discussing for some time before. He induced Debendro Nath Tagore to perform the marriage ceremony of his daughter without any of the idolatrous rites usual on such occasions; he also introduced similar changes into the rites observed at birth and death, and solemnized the first intermarriage—i.e. between persons of different castes. In addition to all this, the new convert urged the adoption of another step for abolishing caste distinctions—viz. "that those who would conduct divine service in the Calcutta Brahmo Somaj should throw off the sacred thread which distinguishes the Brahman from the Sudra." But here Debendro Nath Tagore stopped short; he would not forbid the sacred thread. Thus began a divergence between the conservative and the progressive lines of influence, which caused the secession of many young Brahmos from the Calcutta Somaj, and resulted in their enrolment in November, 1866, by Keshub Chunder Sen (the youth above mentioned) into a separate society, entitled "The Brahmo Somaj of India," with a view to make it the centre of all the Somajes of the country.

Among the earliest tracts issued by Keshub Chunder Sen, there appeared an English series (1860–61), containing an exposition of the principles of Brahmoism in the form of dialogues between a Brahmo and an "inquirer," who successively discuss the topics of prayer (always the starting point of Keshub's propaganda), religious union, intuition, revelation, atonement, and salvation. (The fundamental belief of the existence of God is not debated, the "inquirer" having been recently converted to that already, by a process not described.) From these tracts, and from a spiritual lecture delivered by Keshub in 1863, in reply to a Christian antagonist, a very clear view may be gained of the Brahmoism of this period, which may be epitomized as follows—

1. The human mind has been so constituted by God that certain fundamental truths are *intuitively* perceived by it, e.g. the existence and moral perfection of God, the sense of duty, and the immortality of the soul. But "this

knowledge, again, lies potentially in the human mind, and needs awakening in order to be revealed and apprehended in actual consciousness."

2. Revelation, which "denotes religious knowledge communicated by God to man," "is subjective, not objective. . . . That which is a revelation to you does not necessarily become a revelation to me, or to any other person." "Revelation is a state of the mind, a process of intelligence, a truth, an actual fact of consciousness."

3. In a secondary sense, however, revelation "means an outward objective collection of principles coincident with our natural and intuitive convictions, which renders more vivid our intuitive apprehensions, and aids us in the attainment of truth and salvation." In this sense it embraces a variety of sacred teaching. "Whatever tends to enkindle noble sentiments, remove impurities, awaken faith, and bestir the will to practical virtue—whatever leads us to know and love the truth as it is in God, is fairly entitled to be called revelation; it is immaterial where it is found."

4. Man stands in imperative need of salvation from sin, but not of salvation from punishment when he has sinned. However entirely God may, and ever does, accept our repentance, he must yet punish us for our sins in order to deliver us from them; and instead of weakly praying to escape His purifying discipline, we should dutifully accept it as the truest sign of his fatherly love. "Thus the only repentance is repentance and amendment; the true salvation is deliverance from sin." "To every sinner, even the vilest, the promise of reconciliation hath been made. The arms of everlasting mercy are stretched for the reception of all; the fault is ours if we neglect to have recourse to him."

It will be seen that this faith left room for the reception of most of the general teaching of the New Testament, though it distinctly repudiated the theological basis of Christianity. In these respects it much resembled the spiritual theism of England and America, as represented by Francis W. Newman, Theodore Parker, and Miss Cobbe.

With such capitally repudiating an "infallible book," Keshub Chunder Sen has always shown a sympathetic appreciation of the religious life manifested in the Bible, and in 1866 he delivered a lecture in Calcutta on "Jesus Christ, Europe, and Asia," in which he gave full and eloquent utterance to his reverence for the character and teachings of Christ, holding them up as a bond of union between Europeans and Asiatics, which should lead each party to subline its own special facts, and recognize the other's characteristic merits.

With respect to the condition of women, the Brahmos made a beginning of improvement by encouraging female education, discouraging child-marriages, and seeking to associate the sexes in a common faith and worship.

Unlike the efforts made by certain thinkers in Europe to establish a system of deism of a speculative character merely, the movement combined with a Unitarian theology a piety of the evangelical type which delighted to dwell upon sacred truths with a frequency and tenacity truly Oriental. Services for hours long and religious exercises lasting almost the whole of a whole day were not unfrequent, and the chanting of hymns was practised until it raised the worshippers to a kind of ecstasy.

Very high hopes were entertained by the Unitarians of England and America that this movement would effect a regeneration of the religious life of India. It does not mark the first effort made there to free that religious life from the debasements of idolatry, and society from the barriers of caste. The teachings of Kabir, of Dadu, of Nanak Shah, and others, bear witness of the struggles of the Indian mind in these directions, but never before have the conditions been so favourable to reform as they are now. Education has placed the intellect of India in communication with the mind of the West, and the truths of history, of science, and

of philosophy, thus made known, have effected a complete mental revolution there. Moreover the British government, which, while restraining openly immoral and cruel practices, yet permits the utmost freedom of religion and protects the various sects from any external violence from each other, gives an amount of freedom that is of the greatest value to all advocates of change or reform. Thus when Keshub Chunder Sen visited England in 1870 to study English civilization and enlist sympathy for his church and country, he received a cordial welcome from persons of all classes and denominations, and produced a very favourable impression by the spirituality of his teaching, the nobleness of the aims he advocated, and the simplicity of his life. Since that period, however, the Brahmo Samaj has developed in a different direction to that which was anticipated in England, and its character in some respects has undergone an entire change. This alteration has been accompanied by strife and division, and many of Mr. Sen's former friends have deserted him. The marriage of his daughter to an Indian maharajah, under circumstances directly opposed to his own former teaching, first introduced the element of discord. In his attempted justification of the part he had taken in this affair Mr. Sen pleaded the high sanction of divine authority or inspiration.

In the setting apart of the first building for the public worship of the Brahmo Samaj it was declared by Rammo-lun Roy that no sacrifice, offering, or oblation of any kind or thing was to be permitted, and as before stated, Debendro Nath Tagore, in 1850, endeavoured to base its theology on nature and intuition. In 1881-82, however, Mr. Sen introduced a number of ceremonies into the worship which involved ritual of the most elaborate character, and claimed for the movement special divine authority. In an address delivered in the Town-hall, Calcutta, he said—"Assuredly, it is the Lord of heaven who has sent this new gospel into the world. . . . The new dispensation is Christ's prophecy fulfilled. Did not Jesus predict and foreshadow a fuller dispensation of light and grace? Did he not say the comforter would come after him and guide the world into all truth?" The ceremonies are too numerous and complicated to be described here, but they include the eating of rice and drinking of water, and the immersion of the body in water, in imitation of the Christian sacraments of baptism and the Lord's supper. There has also been introduced the burning of wood and butter in an iron fire-pan to symbolize the destruction of sin, the use of banners, medals, lighted candles, and elaborate processions. Even the drama has been called to the aid of the new faith, and a kind of miracle play, but with the scenes and characters laid in the present day, was performed in 1882, Mr. Sen appearing upon the boards to personify one of the characters of the piece.

The death of Mr. Sen in 1884 deprived the Brahmos of their most influential leader, and it remains to be seen whether the work of the society can be continued successfully in the absence of his commanding personality.

So far as numbers are concerned the total number of Brahmos is now estimated at about 7000 or 8000, and they have between fifty and sixty places of worship in various parts of India. A large proportion of them are young men who have been educated at the English colleges. All who receive a liberal English education renounce idolatry; some embrace orthodox Christianity, while others become sceptics, but apparently the greater number become theists. It would be a mistake, however, to regard all the latter as true Brahmos, as many of them are too timid to commit themselves heartily to all which true theism implies.

(See "Keshub Chandra Sen and the Brahma Samaj: being a Review of Indian Theism from 1830 to 1884, with Selections from Mr. Sen's Works," by T. E. Slater, one vol., London, 1884.)

BRAILLOW or BRAILA. See **IBRAILA.**

BRAIN. This is the name usually given to the portion of the nervous system found in the skull. In man and all the higher animals the nervous system consists of white cords called *nerves*, and of large central masses termed *ganglia*. The latter form a long cord passing down the tube called the vertebral canal, which is constructed by the chain of vertebrae constituting the spinal column. This portion of nervous matter is termed the spinal cord, and is continuous with the brain in the skull. Thus the central portions of the nervous system consist of brain and spinal cord, forming the *cerebro-spinal system*. In all animals having a backbone the cord is much alike in general struc-

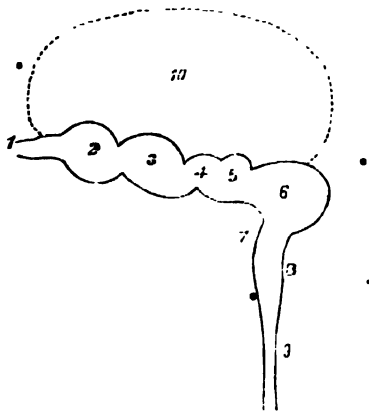


FIG. 1.—Diagram of an Ideal or Typical Brain. 1, olfactory lobes; 2, cerebrum; 3, corpus striatum; 4, optic thalamus; 5, optic lobe; 6, cerebellum; 7, pons Varolii; 8, medulla oblongata; 9, spinal cord. The dotted curve indicates the possible development of the cerebral lobes.

ture and arrangements, but one animal differs from another, as a fish from a frog, or a pigeon from a rabbit, by the degree of development of the brain. This consists of a series of masses of nervous matter or *ganglia*, which in a typical brain may be represented as in fig. 1.

1, The olfactory lobes; 2, cerebral lobes; 3, corpora striata; 4, optic thalami; 5, optic lobes; 6, cerebellum; 7, pons Varolii; and 8, medulla oblongata. A simple brain of this kind exists in many fishes (fig. 2), where the cerebral hemispheres (two) are very small. In amphibians, as in the common frog (fig. 3), the cerebral lobes are



FIG. 2.—Brain of Common Gurnard. 1, olfactory; 2, cerebral lobes; 3, corpora striata; 4, cerebellum.



FIG. 3.—Brain of Common Frog. a, olfactory; b, cerebral lobes covering corpora striata; c, corpora quadrigemina, or optic lobes; d, cerebellum (rudimentary); e, back of medulla.



FIG. 4.—Brain of Tortoise. 1, olfactory; 2, cerebral lobes; 3, corpora striata; 4, optic lobes; 5, cerebellum. Part of the surface of the cerebral lobes has been removed to show the cavities in the interior, termed the *ventricles*.

larger, and pass backwards so as to overlap the corpora striata. Again, in reptiles, for example, the tortoise (fig. 4), the cerebral hemispheres are still larger, broader, and thicker. On cutting off the top of the hemispheres, we now

find the first appearance of cavities called ventricles. The hemispheres are also united by a band of fibres termed the corpus callosum. The cerebellum is still feebly developed.

When we come to birds we find the cerebral hemispheres have undergone so great an enlargement as to overlap corpora striata and optic thalami. The cerebellum has also become larger, and by its development forwards has

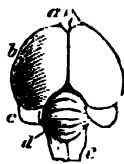


FIG. 5.—Brain of Pigeon. View from above. a, olfactory lobes; b, cerebral lobes; c, corpora striata; d, optic lobes; e, cerebellum; f, medulla.



FIG. 6.—Brain of Pigeon. Lateral view of a Bristed Bunting. a, olfactory lobes; b, cerebral lobes; c, corpora striata; d, optic lobes; e, cerebellum; f, medulla; g, corpora striata.

thrust downwards the optic lobe on each side, as seen in fig. 5.

Immediately behind the optic lobes there may now be seen a bridge-like structure of nervous matter called the *pons Varolii*. In birds also the *corpus callosum*, or band of fibres connecting the one hemisphere with the other, is more highly developed than in reptiles. In the lower orders of the Mammalia, as in Marsupialia (kangaroos, opossums, &c.), and in Edentata (clothes, &c.), the brain, except as regards the size of the cerebral hemispheres, does not present a great advance on that of birds. In the forms of mammals, such as Rodentia (beavers, rabbits, mice, &c.), the hemispheres are still larger, but their surface is quite smooth, as seen in fig. 7. In still higher forms, such as Carnivora (dogs, cats, horses, &c.), the hemispheres are not only larger, but have the surface thrown into a series of plaits or folds called *convolutions*, as seen in fig. 8.



FIG. 7.—Rabbit's Brain. 1, olfactory; 2, surface of cerebral lobes; 3, corpora striata; 4, optic lobes; 5, cerebellum.



FIG. 8.—Dog's Brain. 1, olfactory; 2, surface of cerebral lobes; 3, corpora striata; 4, optic lobes; 5, cerebellum.

In the remaining orders of mammals the hemispheres continue to enlarge, chiefly growing downwards and backwards, so that in the higher apes and in the human being they completely overlap the cerebellum. The essential difference between the brain of man and that of any other mammal is the preponderating size of the cerebral hemispheres.

If a section be made through any portion of brain, it will be seen to be composed of white and gray matter. The white matter, consisting of nerve-fibres, is found in the central portions, whilst the gray matter, composed of small cellular bodies called *nerve-cells*, along with delicate nerve-fibres, covers the surface.

Having given a description of what may be termed a typical brain, we will now consider the organ as it is found in man. It may be divided into three parts—the *cerebrum*, or brain proper, which occupies the whole of the superior part of the cavity of the skull; the *cerebellum*, which

smaller than the cerebrum, whence its name, little brain, occupying the lower and back part of the skull immediately above the nape of the neck; and the *ganglia* at the base, viz. from before backwards, the *corpora striata*, *optic thalami*, and *corpora quadrigemina*, the latter being the bodies above described as optic lobes. The brain is connected with the upper part of the spinal cord, called the

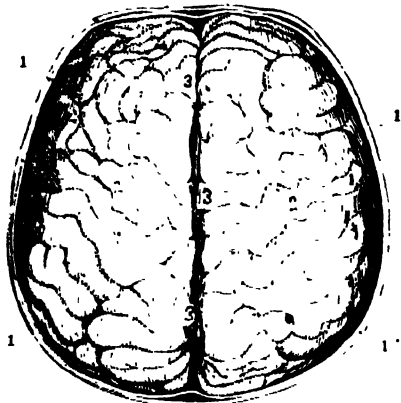


FIG. 9.—Upper Surface of the Brain. 1, cut edge of the bones of the cranium; 2, superior convex surface of the two hemispheres of the cerebrum, with their convolutions; 3, separation between the two hemispheres of the cerebrum occupied by the falx cerebri.

medulla oblongata, by two great bands of fibres, termed the *crura* or *peduncles*. The *pons*, already alluded to, embraces the upper part of the medulla, and consists largely of fibres passing transversely from one side of the cerebellum to the other.

The surface of the brain is represented in fig. 9.



FIG. 10.—Base of the Brain. 1, anterior lobes of the cerebrum; 2, middle lobes of the cerebrum; 3, posterior lobes of the cerebrum; 4, fissure separating the anterior from the middle lobes; 5, situation of the superficial excavation forming the boundary between the middle and the posterior lobes; 6, the two hemispheres of the cerebellum composed of flattened laminae or layers; 7, the medulla oblongata, which in this position of the brain rests upon and covers the vermiciform process; 8, corpora pyramidalia; 9, corpora olivaria; 10, tuber annulare, or *pons Varolii*; 11, decussation of the corpora pyramidalia; a, b, c, d, cerebral nerves.

It will be observed that the whole of the external convex surface of the hemispheres is divided into numerous folds, the convolutions, which run in different directions, and are

of different sizes and lengths in different parts of the hemisphere. The fissures between the convolutions, called *sulci*, penetrate to a depth of about an inch and a quarter. For convenience, each hemisphere may be regarded as consisting of an anterior, middle, and posterior lobe. Great nerves, supplying the organs of sense and muscles of the face, issue from the base of the brain, which is shown in fig. 10.

The reader is also referred to the Plate BRAIN, showing two diagrammatic views of the cerebral system.

The brain is closely enveloped in three distinct membranous coverings, two of which have been called *mater*, from a fanciful notion of the old anatomists that they give rise to all the other membranes of the body. The external covering termed *dura mater*, from its being of a firmer texture than the other two membranes, incloses the brain with all its appendages, and lines the whole internal surface of the bones of the cranium. It is of a fibrous texture; the component fibres interlacing each other in every possible direction, and forming by their firmness and density the thickest and strongest membrane of the whole body.

It gives off several elongations or productions called *processes*, which descend between certain portions of the brain, the most remarkable of which is termed the *superior longitudinal process*, which extends from the fore to the back part of the skull, between the lateral halves of the cerebrum. Narrow in front, it becomes gradually broader as it passes backwards, bearing, as has been conceived, some resemblance in shape to a sickle or scythe, whence the common name of it, *falx cerebri*.

Moreover, the component fibres of the *dura mater*, in certain parts of its course, separate into layers, which are so disposed as to leave spaces between them, for the most part of a triangular form. These triangular spaces, which are commonly termed *sinuses*, are lined by a smooth membrane perfectly analogous to that which lines the veins in the other parts of the body; and these sinuses perform the office of veins, returning the blood from all parts of the brain to the neck.

The smooth surface of the brain, which is exposed on the reflection of the *dura mater*, is covered by its second investing membrane, named the *tunica arachnoida*, from the extreme tenderness and delicacy of its tissue, which gives it a resemblance to a spider's web. This thin, colourless, and transparent membrane is spread uniformly over the surface of the brain, covering all the eminences termed convolutions (fig. 9, 2, 2), but not insinuating itself between any of the depressions between the convolutions.

The third investing membrane, the *pia mater*, derives its name, like the former, from the tenderness and delicacy of its tissue; but, unlike the *tunica arachnoida*, in which not a single bloodvessel has hitherto been discovered, the *pia mater* is exceedingly vascular. The bloodvessels with which every part of this delicate membrane is covered are the nutrient arteries of the brain; before they penetrate the brain these vessels divide, subdivide, and ramify to an extreme degree of minuteness upon the external surface of this membrane, so that the blood does not enter the tender cerebral substance with too great force.

The development of the brain in man during early life shows a series of stages similar to the brain of the lower animals. Even at birth the convolutions are small, and the depth of gray matter covering them is much less than in adult life. Still, no part of the body increases with greater rapidity, nor undergoes such proportional development, as the brain in the early years of life. Thus, in the male it reaches about five-sixths of its ultimate weight by the end of the seventh year, and in the female about ten-elevenths of its ultimate weight by the same period. It appears to grow until some period between the twentieth and fortieth year, reaching its maximum size probably about the thirty-fifth year; from forty to fifty there is a

slight diminution in weight, and a greater one between fifty and sixty. After sixty the rate of decrease is still greater, so that in the eighth decade the brain may weigh 3 or 4 oz. less than it did during the fourth.

Whilst there are remarkable differences as to weight of brain in races and in individuals, the following table shows average results:—

Under-sized Brains.	Medium-sized Brains.	Over-sized Brains.
Men under 37½ oz., and Women under 32½ oz.; always idiots.	Men 40 to 52½ oz., and Women 35 to 48 oz.; average intelligence.	Men from 52½ oz. to 55 oz., and Women 48 oz. to 52 oz.
Men about 40 oz., and Women about 35 oz.; of weak intellect.		

It will be seen from this table that there is a wide range of variation in brain-weight. As a general rule, men of great mental powers and acquirements have heavy brains. For example, the brain-weights of certain distinguished men were as follows:—

Name.	Profession.	Age.	Ounces.
Cuvier, ...	Naturalist, ...	63 ...	61½
Abercromby, ...	Physician, ...	64 ...	63
Schiller, ...	Poet, ...	46 ...	63
Webster, ...	Statesman, ...	70 ...	53½
Chalmers, ...	Theologian, ...	67 ...	53
De Morgan, ...	Mathematician, ...	73 ...	52½
Grote, ...	Historian, ...	76 ...	49½

Such a table shows that there is no necessarily invariable relation between size of brain and intelligence. The heaviest brain on record weighed 67 ounces, and was that of a bricklayer who died in University College Hospital, London, in 1849. This man showed no remarkable mental power. Brain action depends as to efficiency not on the mere size of the organ, but on the perfection of its microscopical structure and on the quality and quantity of blood supplied to it. Thus one can conceive that a well-constituted brain of small size, nourished in an efficient manner, may be able to do better work than a larger one whose constitution or blood supply is inferior. Still the general rule holds good that there is a correspondence between size of brain and degree of intelligence.

In determining the question of size of brain and intelligence it must be remembered that the organ is not entirely devoted to intellectual operations, but that a large portion of it is concerned with muscular movements many of which are involuntary. The ratio of brain-weight to body-weight is therefore subject to great variations. Thus the weight of the brain of the Greenland whale is to the weight of its body as 1 to 3000; the ox, 1 to 860; the elephant, 1 to 500; the horse, 1 to 400; the dog, 1 to 300; the cat, 1 to 150; the rat, 1 to 76; man, 1 to 36; the mouse, 1 to 31; the canary, 1 to 14; and a blue-headed tit, 1 to 12. Animals of great size, with large and powerful muscles, have large brains, but the proportion of brain-weight to body-weight will be small. Thus the elephant has absolutely the heaviest brain, but the largest brain, in relation to body-weight, is in man, in small mammals, and in small birds. The largest and heaviest cerebral hemispheres are found in man. The general rule is that the ratio of brain-weight to body-weight in animals belonging to the same group, but varying much in size, is greater

in the smaller animal. For example, in a marmoset monkey it is as 1 to 20, whilst in the gorilla it is as 1 to 200.

We shall now consider the functions of the different parts of the brain.

1. *Cerebrum*.—The hemispheres are the organs concerned in sensation, volition, emotion, and intellectual acts. This is shown by various lines of evidence. (1) In the animal kingdom generally, a correspondence is observed between the quantity of gray matter, depth of convolutions, and the sagacity of the animal. (2) The results of experiments are that on slicing away the surface of the cerebrum, the animal becomes more dull and stupid in proportion to the quantity removed. (3) Inflammation of the membranes covering the surface of the brain, especially if it involve the superficial layer of gray matter, causes delirium, and afterwards coma. (4) Inflammation at the base of the brain, or involving the white matter, causes paralysis or convulsions; and (5) Pathological states of the gray matter, such as congestions, softening, degenerations, or the formation of new products, are always associated with the various forms of insanity, but the exact changes peculiar to each form, for example, mania as contrasted with melancholia, are still imperfectly known.

Recent experiments by Hitzig, Fritsch, and Ferrier show that electrical-irritation of certain portions of the convolutions in the middle region of the hemispheres causes movements of definite groups of muscles. Thus, when one spot is irritated, the fore limb on the opposite side is extended or flexed, whilst irritation of another area not far off causes movements of the lips or eyeballs. Many physiologists therefore hold the theory that there are areas of gray matter in the middle region of the hemispheres, forming *motor centres*, whence emanate nervous impulses producing specific movements. This theory is consistent with the fundamental doctrine of the older phrenologists, that the cerebrum is a compound organ consisting of various portions having different functions. Another fact in support of this view is that a particular portion of the cerebrum, namely, the third frontal convolution on the left side, is specially connected with the mechanism of speech. Thus, a clot of blood in this region, as frequently happens in apoplexy, causes disorder of speech, the patient having the idea of what he wants, without being able to give it articulate expression. At the same time, phrenologists have no reasonable ground for allocating specific areas of gray matter to various mental faculties, and still less for holding that there are elevations and depressions on the surface of the brain corresponding to the general surface of the skull.

2. *Corpora Striata*.—These bodies are connected with the hemispheres. From them motor nerve-fibres pass through the crura of the cerebrum to the medulla oblongata, where they decussate, pass down the anterior part of the spinal cord, and then issue from the cord by the anterior roots of the spinal nerves, ending in the muscles. Thus the right corpus striatum is connected with the left side of the body, and vice versa. This explains why an apoplectic effusion of blood in one side of the brain causes paralysis of motion or hemiplegia on the opposite side.

3. *Optic Thalami*.—These are the centres receiving sensory impressions, especially those called touch, from all parts of the body. The sensory fibres enter the spinal cord by the posterior roots of the spinal nerves, cross to the opposite side of the cord, and then run upwards through the medulla and crura to the optic thalami. Thus the optic thalamus on one side receives impressions from the opposite side of the body. It is not supposed, however, that they are the seat of consciousness. This mental condition occurs when the impression reaches the hemisphere above.

4. *Corpora quadrigemina*.—These bodies receive the fibres of the optic nerve, carrying impressions produced by the action of light on the retina of the eye, thus holding

the same relation to visual impressions as the optic thalamus do to tactile impressions. Disease of these bodies causes blindness and insensibility of the iris of the eye to the action of light.

5. *Cerebellum*.—This organ is connected superiorly with the last-mentioned bodies, inferiorly with the posterior part of the spinal cord, whilst its lateral halves are united by the transverse fibres forming the pons. The results of experiment, and the observation of diseased conditions, which are rare, show that the cerebellum is the regulator or co-ordinator of muscular movements. Thus a movement such as occurs in picking up a pencil from a table involves the action of many muscles, each contracting at the proper time and to the proper extent. This is co-ordination, and it would appear that the cerebellum is the organ carrying it out.

6. *Medulla oblongata*.—This is, strictly speaking, the upper portion of the cord. Through it nerve-fibres pass upwards and downwards, and in it are masses of gray matter connected with the roots of important nerves. The great nerves concerned in the movements of respiration, the movements of deglutition or swallowing, the movements of the heart, and the movements of the bloodvessels originate in the medulla. For this reason injury to the medulla causes almost instant death.

The ganglia at the base of the brain are concerned in many reflex or unconscious muscular actions; for example, the movements of the pupil under the influence of light, the unconscious movements of walking, when the attention is deeply engrossed, or as in a somnambulistic state, and many other unconscious movements. See NERVOUS SYSTEM.

BRAIN CORAL or **BRAINSTONE CORAL**, the common name for corals of the genus *Meandrina*, which bear a resemblance in their rounded shape and numerous convolutions to a human brain. In its formation the mouths of the polyps, instead of being separate, are ranged in rows, and the surface of the coral is thus formed of a series of sinuous elongated cells or furrows. Brain corals are often, for their beauty mounted as ornaments to a table or sideboard, and they are very common in collections. They sometimes grow to an immense size, attaining a diameter of 8 or 9 feet. A very large specimen is preserved in the British Museum. They are chiefly found in the seas of warm climates, especially those of the Indian and South Atlantic Oceans.

BRAINTREE, a market-town of Essex, 14 miles N.E. from London by the Great Eastern Railway, is situated on rising-ground on the north bank of Pod's Brook, which falls into the river Blackwater. The main street extends towards the village of Bocking, which is on the opposite or north-eastern bank of the Blackwater, while Bocking Street extends towards Braintree, and the two places are thus continuous. A good supply of water is obtained from an artesian well in the neighbourhood. The principal buildings are the Church of St. Michael, a large structure chiefly built of flint stones, and the Corn Exchange. There are large silk and crape mills, an extensive brush manufactory, and corn-mills. Straw-plaiting is also carried on. The town obtained some notoriety in connection with political and ecclesiastical proceedings, being the place which procured the decision in the House of Lords that a majority of the parishioners had the power of granting or withholding a church rate. The population of the town in 1881 was 5182. Numerous British and Roman remains have been found in the vicinity, and Braintree is supposed to have been a British and Roman station successively. It is also very probable that the town was on the Roman road from Colchester to St. Albans. It is mentioned in Domesday Book under the names of *Rainas* and *Brauchetrea*.

BRAKE or **BREAK**, in machinery, a contrivance for retarding or arresting motion, by creating an amount of

friction too great for the moving power, or for the momentum of the machine when the moving power is suspended, to overcome. Though made use of in many varieties of machine, the name is generally applied to the various contrivances for checking the momentum of a wheeled vehicle. One of the earliest devices for this purpose was the shoe-brake, consisting, as the name indicates, of a shoe, generally of metal, which is interposed between the wheel and the ground, and retained in that position by a chain. The revolution of the wheel is thus entirely stopped—the wheel being said to be “skidded”—and a great amount of resistance developed by the friction between the back of the shoe and the ground. But the shoe itself is rapidly worn out, and to remove it from beneath the wheel the vehicle must be stopped and backed, which is a serious loss of time. To obviate this inconvenience “brake-blocks” were introduced. These are pieces of wood or metal, shaped so as to fit a portion of the periphery of the wheel, against which they are pressed by an arrangement of levers or screws. The strap-brake is usually applied to a wheel or drum not actually in contact with the ground. It consists of a strap partly surrounding the wheel, which may be tightened or slackened at will.

By far the most important application of brake-power in recent years has been to the stopping of railway trains. The absolute necessity for some such appliance is seen when it is remembered that a train of fifteen vehicles, travelling at the rate of 42 miles an hour, will run for no less than 15,000 feet, or nearly 3 miles, if no other means to stop it be applied than simply shutting off steam.

The brakes first adopted, and still in use on many English railways, consist of blocks pressed against the wheels by means of screws worked by hand; and these are attached only to the engine, the guards' vans, and sometimes to a compartment of a passenger carriage. When the brakes are firmly screwed down the rotation of the wheels to which they are applied is stopped entirely, and they are skidded or made to drag along the rails. They are thus ground into flat surfaces at the point of contact, to the great and often dangerous injury of the tires and rails.

It was found by experience that these brakes were much more effective in stopping a train when the wheels were not thus skidded, but the brakes applied with such a pressure as just to permit the wheels to revolve, thereby causing as much friction as possible between the wheel and the brake-block, and avoiding the injury to wheels and rails. As, however, only the wheels of the engine and of the brake-van could be acted upon, this, though sufficient under ordinary circumstances, was not so in cases of emergency. It therefore became necessary to devise means for applying the brake-blocks simultaneously to the wheels of every vehicle in the train. Another requirement in an efficient brake is automatic action; so that in the event of the couplings of a train parting, the brakes may either spring on of themselves, or both portions of the train be still provided with a perfect brake, one under the control of the driver, the other under that of the guard.

These requirements are more or less supplied by the chain-brake and several varieties of vacuum, hydraulic, and compressed-air brakes. Of these the “chain-brake” is one of the oldest. It consists essentially of a chain extending under the carriages for the whole or part of the length of the train. One end of this chain is attached to a loose drum on an axle of the brake-van, and by means of a trigger under control of the guard this drum can be brought in contact with one keyed fast on the axle. By this means the chain is wound up, and as it tightens it applies the brakes on all the vehicles it passes under. The brake can also be applied from the engine by means of a communication cord, which can be contrived to bring it automatically into action should the train become accidentally divided. This brake, though very effective under ordinary conditions,

is liable to be interfered with by wet weather, or by the formation of ice on the chain or friction drum. Clark's chain-brake, however, works on the converse principle. The chain is wound up and kept in a state of tension by suitable gear in the guards' van or the engine while the train is running, in which condition it prevents the brakes from acting, but on its being loosened, either by the person in charge or by the division of the train, the brakes are at once brought into operation by powerful springs, which are connected with the brake-blocks of each vehicle.

There are a considerable variety of brakes, termed vacuum brakes, worked by atmospheric pressure. In its simplest form the vacuum-brake consists of a cylinder or flexible chamber on each vehicle, connected by a pipe running the whole length of the train with a steam air-ejector or air-pump on the engine. When this is put in operation a partial vacuum is produced in the pipe and in each of the flexible chambers. The latter at once collapse under the external pressure of the atmosphere, and their lids (or, in the case of a cylinder, piston rods) being connected with the brake-blocks by a system of levers, exercise sufficient pressure to put on the brakes. It is obvious, however, that any accident which involves injury to the continuous pipe renders the production of a vacuum impossible, and the brakes may thus be rendered useless at the very time when they are most needed.

To meet this difficulty several systems of automatic vacuum-brakes have been devised. In most of these a vacuum is permanently maintained in the continuous pipe, and also in a vacuum-chamber (a species of reservoir of power) under each carriage. When the vacuum in the pipe is destroyed, either intentionally by opening a valve or by any accident to the pipe, the connection between the pipe and vacuum-chamber is cut off, and a communication is opened between this chamber and the flexible chambers or "brake-cylinders," when the brakes are put on by the pressure of the atmosphere on the pistons. In some varieties of these brakes a vacuum is permanently maintained on both sides of the piston in the brake-cylinder, and the brakes are put on by the admission of air on one side only of this piston, and taken off either by the restoration of the vacuum or by the admission of air to the other side also. Provision is sometimes made, as in the Clayton brake, by means of a "leak-hole" in the piston, for the brakes releasing themselves within a certain time after application, to avoid the necessity of taking them off.

Vacuum-brakes, as a class, are subject to the objection that the power available is limited to something less than the pressure of one atmosphere, and that where much power is required to work the brakes the necessary apparatus is somewhat bulky and heavy, but they have been extensively adopted in England.

Hydraulic power has also been made use of to actuate continuous railway brakes. The liquid used is salt water, stored under pressure in an accumulator, into which it is forced by a steam pump. There is a continuous pipe throughout the train for the conveyance of this liquid, and under each vehicle there are two separate reservoirs or accumulators, each containing a piston and powerful spring. The brakes are in the ordinary course applied from the engine by forcing liquid through the continuous pipe, and through one of the reservoirs into the "brake-cylinders," where it actuates the piston in connection with the brakes, and puts these on by direct hydraulic pressure. It is only in case of an accident to the supply pipe that the reservoirs of fluid under spring pressure come into operation. The liquid in one reservoir is free to escape through the broken pipe, thereupon the piston descends, and in so doing closes the communication between the pipe and the brake-cylinders, at the same time opening a communication between them and the liquid stored under pressure in the second reservoir, which at once puts on the brakes. The chief

danger connected with hydraulic brakes is the risk of the liquid freezing in cold weather, which is partially overcome by using salt water.

Another motive power which has been successfully applied to continuous brakes is compressed air, which can be supplied from a force pump on the engine, and stored at a pressure of several atmospheres in suitable reservoirs.

The essential parts of the compressed-air brake of Messrs. Steel & M'Innes are illustrated in figs. 1 and 2 of Plate, which are vertical sections at right angles to each other. In this system the air is compressed by a force pump attached to the engine, and stored in large reservoirs on the engine or tender. At each end of each carriage in the train is a cylinder, A (figs. 1 and 2), fitted with a piston, H, and piston-rod, J. The two cylinders in each carriage are connected by a pipe at their upper ends, this pipe passing along the roof of the carriage. The lower part of each cylinder is connected with an air-vessel, N, with which it forms one piece. This is connected with the air-pipe, S, by the branch, R, containing an accurately fitting ball valve at Q, by which the air is prevented returning from the air-vessel, N. The cylinder, A, has its upper end closed, but the lower is provided with a cover and stuffing-box, F, like an ordinary steam cylinder. On the inner side of the cover a cylindrical projection, G G, forms a rest for the piston, H, when in its lowest position. It is cushioned at the top with india rubber to deaden the fall of the piston. With the same object the piston itself is cushioned on its upper side with rubber, and it is packed with leather so as to work air-tight in the cylinder, A. The piston-rod, J, is connected by the links, K, with the lever, S, fixed upon the brake-shaft, T, which is carried on brackets attached to the framework of the carriage.

The compressed-air cylinders throughout the train are connected between the vehicles by flexible tubing provided with couplings, represented at J' (fig. 2). Openings are formed at each side of the upper part of the cylinder, A, faced with caoutchouc rings, X. Opposite each opening are the screws, C C, provided at the ends with anti friction thimbles, D D, and at the outer extremities with handles, E E. To connect the air cylinders of two carriages a hollow metallic T piece, J' (which is secured to the end of the flexible tube), is held between the thimble, D, and the elastic ring, X. By simply tightening the screw, C, the joint is made air-tight. If the other opening is not in use it is closed by screwing the thimble, D, against it. The action of the brake is as follows:—Compressed air is fed into the cylinder, A, and chamber, N, by the pipe, S, and branch, R. The pressure being equal on each side of the piston, H, it falls (by its own weight and that of its attachments) to the bottom of the cylinder and rests on the stop, G G. As soon, however, as the pressure in the feed-pipe, S, is reduced by the opening of a tap or the rupture of the pipe, the valve, Q, closes, and the expansion of the compressed air in the chamber, N, and lower part of the cylinder, A, forces up the piston, H, and by means of the links, K, and lever, S, the brake-shaft, T, is turned, and the brakes are put on. When it is desired to withdraw them, compressed air from the reservoir on the tender is readmitted to the feed-pipe, S, the piston again falls to the bottom of the cylinder, and the brake-blocks are released. As above mentioned the pipe connecting the two cylinders on each vehicle generally passes along the roof. There is on each carriage a valve, which can be opened by pulling any one of a series of handles hanging in each compartment of the carriage. This allows the air to escape, and puts on the brakes, and the escaping air is utilized to sound a whistle placed on the top of the carriage in which the handle has been pulled; while in the latest modifications of the system a raised disc indicates the compartment from which the alarm has been given.

The Westinghouse automatic brake is also worked by

compressed air. It consists of a force-pump on the engine, a reservoir for compressed air on the engine, and another smaller reservoir on each vehicle throughout the train. These reservoirs are connected by a continuous pipe, the pressure in which is regulated by a tap or "brake-valve" under control of the driver and guard. Besides the air-reservoir each vehicle carries a brake-cylinder, with a pair of pistons acting outwards from each end, by which the brakes are worked. Between the reservoir and the brake-cylinder there is a valve which acts as follows:—

When the pressure of air in the continuous pipe is not less than that in the reservoirs throughout the train, the valve keeps open the communication between the pipe and the reservoirs, while it closes that between the reservoirs and brake-cylinders. In these circumstances the brakes are kept off by means of springs. When the pressure in the feed-pipe is reduced, however, even by one-fifth, the communication between pipe and reservoir is closed, and at the same time the reservoir and brake-cylinder are connected. The expansive force of the air from the reservoir causes it to enter the brake-cylinder between the two pistons, which it forces asunder, and thus puts on the brake. On the pressure in the feed-pipe being again restored (which is done by the driver connecting it with the large air-reservoir on the engine), the valve returns to its original position, closing the connection between the small reservoir and the brake-cylinder, and allowing the air in the latter to escape.

The principal parts of this ingenious system are illustrated in our Plate. Fig. 3 represents the "driver's brake-valve," by which the brakes throughout the train are controlled. The compressed air passes from the main reservoir on the engine into the chamber, *A*, in which is the rotating valve, *B*, pressed upwards by a spiral spring. When the handle is in position for filling the brake-pipe, compressed air passes through an opening in the valve, *B*, into the chamber, *C*, and so to the brake-pipe. When the handle is in its ordinary position a passage of only one-eighth inch in diameter is open between the chamber, *B*, and the chamber, *C*, in order to maintain the pressure in the brake-pipe. The entrance to the chamber, *B*, however, is closed by valve, *E*, acted on internally by a spring of about 15 lbs. power to the square inch of valve surface, so that the pressure in the main reservoir must exceed that in the brake-pipe by 15 lbs. to the inch before the air can pass from the former to the latter. To apply the brake the handle is turned to the right, which relieves the pressure of the cap, *F*, on the spring, *G*, and allows the discharge valve, *H*, to be raised from its seat by the internal pressure, thus discharging air from the brake-pipe and applying the brakes. At the same time the valve, *B*, rotates with the handle, and closes all communication between the chambers *A* and *C*. If the handle is turned as far as possible to the right, the air is discharged from the brake-pipe with great rapidity, and the brakes applied with full force. If turned to a lesser extent a smaller escape takes place, and the force of the brake is reduced accordingly.

To release the brakes the handle is turned as far as possible to the left. This closes the discharge valve, *H*, and at the same time causes the valve, *B*, to open a free communication between the chambers, *A* and *C*, thus relieving the brake-pipe from the main reservoir.

Fig. 4 represents the "triple valve," situated under each carriage. It consists of a case having pipe connections to the main-pipe, to the main reservoir under the carriage, and to the brake-cylinder. The case contains a valve, *a*, connected with a piston-rod, *b*, which again moves a slide-valve, *c*, by the action of two collars on the rod. Compressed air is introduced by the main supply-pipe under the valve, *a*. It forces this valve to the top of its chamber, and then feeds past it by the "feed-groove," *d*, into the upper part of the case, and thence by the pipe, *e*, to the

small reservoir, until the pressure in the latter is equal to that in the main-pipe. The slide-valve, *c*, which is shown covering the pipe, *f*, which leads to the brake-cylinder, has two ports, numbered 1 and 2 in our illustration. When the brakes are off, port 1 (as shown) connects the pipe from the brake-cylinder with an exhaust-port, thus allowing the cylinder to empty itself. In order to apply the brakes gently the pressure of air in the main-pipe is slightly reduced. The superior pressure in the reservoir then forces the valve, *a*, down, closing the feed-groove, *d*, and moving the slide-valve, *c*, until the port 2 comes opposite the pipe from the brake-cylinder. By the same movement the plug, *p*, having been withdrawn from this port, air from the reservoir flows through the narrow passage into the brake-cylinder, and acts on the brakes. The exhaust opening is of course closed by the slide-valve.

If, however, a great reduction of pressure is made in the main-pipe, the valve, *a*, sinks to the bottom of its chamber, and the opening to the brake-cylinder is entirely uncovered by the slide-valve. The compressed air rushes in from the reservoir and puts the brakes on with full force. To take the brakes off the pressure in the main-pipe is restored, when the valves again take the position shown in our Plate, and the air from the brake-cylinder escapes. This cylinder is shown in fig. 5. It contains two pistons forced together by spiral springs. One piston-rod passes through each end of the cylinder without any stuffing-box. When the brakes are off the pistons are kept in contact by these springs, but when air is forced between them from the pipe, *r*, they are separated, and the brake-levers are put in motion by the piston-rods.

The connections of the main-pipe between the carriages are formed by flexible couplings.

In 1878 the Board of Trade issued a circular in which they indicated the leading features which they considered indispensable to an effective brake. These were—1, instantaneity of application; 2, readiness for action; 3, to be self-contained in every vehicle; 4, working condition to be constantly within the knowledge of driver and guards; 5, shortness of distance of pulling up. In their report of the year 1878 the Board of Trade stated that the Westinghouse compressed-air brake was the only one which fulfilled all the conditions officially required; and experiments in that year showed that it was far in advance of any other system. In spite of the results of these experiments, however, most of the large companies continued to cling to the form of brake they had at first adopted, though willing to introduce improvements therein, and such was the reluctance of the companies to change that, in 1879, Parliament was urged to put pressure upon them either to bring up their brake system to the level of the most effective, or to adopt one fully answering the Board of Trade requirements. Such pressure, however, would relieve the companies of a great and important responsibility, and would only be adopted as a last resource. The force of public opinion, and a judicious sense of their own interests, have, since 1879, had a stimulating effect upon the various companies, probably greater than any compulsory enactment. Quite a rivalry set in for the adoption of the most effective brake, but much is still left to be desired in this respect.

In the United States, where the railway mileage open for traffic is nearly five times as great as that of the United Kingdom, the employment of continuous brakes is universal, and they are brought to a high pitch of perfection. It is to be observed, however, that the "block" system—regarded in the United Kingdom as so effective for the safety of railway travelling—is unknown in America.

("Continuous Railway Brakes, a Practical Treatise on the several systems in use," by Michael Reynolds, Lond., 1882.)

BRAMANTE, DONATO LAZZARI, a famous Italian architect and painter, was born at Casteldurante, in Urbino, in July, 1444. He was brought up as a painter, and studied under Fra Bartolommeo of Urbino, called also Fra Carnevale, a painter of reputation in his time; but Bramante's real disposition was for architecture, and from 1474 he travelled through the north of Italy in search of occupation, settling in Milan about 1480, where he found patrons in Gian Galeazzo and in Lodovico il Moro. In Milan he was appointed engineer of the cathedral, and built the choir of Santa Maria delle Grazie; he also furnished plans for the Cathedrals of Foligno and Faenza, as well as for the Cathedral of Pavia, the first stone of which was laid in 1488. He left Milan for Rome, where he was employed by Cardinal Caraffa to rebuild the cloister of the Convent della Pace. For Pope Alexander VI. he executed the famous Cancellaria, a magnificent and spacious palace, which bears the date 1495, and besides being one of the earliest is one of the most important monuments of the Renaissance in Rome. His principal patron, however, was Pope Julius II., for whom he carried out vast and magnificent works. He joined the Belvedere villa to the old palace of the Vatican, and further enlarged and embellished the latter by the addition of the court of San Damaso, and the famous Loggie, which his pupil and nephew, the great Raphael, filled with his celebrated arabesques and scriptural fresco paintings. Raphael was invited to Rome through the representations of Bramante. In 1506 he commenced his greatest undertaking, the rebuilding of the Basilica of St. Peter. Julius II. laid the first stone on the 18th April of that year, and during the next eight years Bramante had erected the four great piers now supporting the dome, and their connecting arches, and had completed the cornice and vaulting in of this portion of the building. He died on the 11th of March, 1515, and was buried beneath the high altar of St. Peter's in the crypt, or *Sagre Grotte Vaticane*. After his death the work of rebuilding St. Peter's was carried on by Raphael, Peruzzi, Antonio da San Gallo, Michael Angelo, and others. By San Gallo the plans of Bramante were very greatly altered; but Michael Angelo fortunately rescued and completed the main portions of Bramante's plan, including the splendid dome which he himself designed. Bramante, and Michael Angelo after him, intended St. Peter's to be in the shape of a Latin cross, that is, with equal arms; the present lengthened nave, giving a Greek cross, as it is called, was added by Carlo Maderna, with the disastrous effect of obscuring the beautiful dome, except at a great distance, and dwarfing both exterior and interior. The façade is hopelessly inferior to the fine work of Bramante and Michael Angelo. An exquisite little circular oratory over St. Peter's place of execution (S. Pietro in Montorio), called the *Tempietto*, was built by Bramante for Ferdinand of Spain, who owned the adjoining convent, in 1502. The position occupied by Bramante in the history of architecture is indicated in the article on that subject.

BRAMBER, a village in the county of Sussex, near to Steyning, $5\frac{1}{2}$ miles from New Shoreham, with a station on the Hoveham and Shoreham Railway, $53\frac{1}{2}$ miles from London, was the Saxon *Brynnburh*, erected probably on the site of a Roman castellum. A fortress was built here by the Saxon kings, on the west bank of the Adur, which after the Conquest was granted to William de Braose. The remains are inconsiderable, and the deep mead now blooms with trees. From the castle mound a fine view may be obtained of the rich marshy littoral, the valley of the Adur, and the broad sweep of the glittering Channel. Bramber formerly returned two members to Parliament, but was disfranchised in 1832. The parish church is at Steyning.

BRAMBLE (*Rubus*) is a genus of plants belonging to the order ROSACEÆ. The following are the most re-

markable species:—*Rubus suberectus* (Upright Bramble) is a British species, and grows on boggy heaths, by the sides of streams, &c., chiefly in mountainous districts of the North. *Rubus micranthus* (Small-flowered Bramble) is a native of Nepal, and one of the most gigantic of the genus, attaining a height of 8 or 9 feet. The shoots sometimes attain a length of 20 feet. There are two other species, *Rubus distans* and *Rubus asper*, found with this in Nepal, which have been grown in this country. *Rubus occidentalis* (the Western Bramble) is a native of Canada and the West Indies, and was introduced into this country in 1696. The Grey Bramble, or Dewberry (*Rubus coccineus*), is a native of Europe and the north-east of Asia, in woods and hedges. *Rubus foliosus*, *Rubus corylifolius*, or Hazel-leaved Bramble, are allied to the Dewberry. *Rubus spectabilis* (Showy Bramble) is one of the handsomest of the genus. It is an elegant shrub, growing to the height of 4 or 5 feet. It flowers in April and May, and has a large dark-yellow fruit, of an acid and astringent taste. It was brought from the banks of the Columbia River, in North America, and is very deserving of cultivation. *Rubus discolor* (Common Blackberry) is one of the most common species of the genus. It is a native of almost all Europe, in hedges, thickets, and woods. The fruit of this species and its varieties are well known as blackberries or bumble-kites, and also scald-berries, from their supposed power of giving scald-head to children. Whenever they grow they are picked by the children of the district on account of their sweet taste. *Rubus discolor* is a good plant for growing on loose dry ground for the purpose of fixing it previous to planting forest-trees. The shoots are used by thatchers for binding their straw, and also for making bee-hives. It is sometimes cultivated in order to produce a picturesque effect in a garden. One of the most distinctive plants of the genus is, the *Rubus arcticus* (the Arctic Bramble). It is a native of the mountains and colder regions of Europe. Its stem never attains a greater height than 6 inches, and is furnished with from three to four leaves, with a single large deep rose coloured flower, which is succeeded by a purplish red fruit lightly prized for its flavour among the Swedes. *Rubus chamaemorus* (the Cloudberry) grows in great abundance in the Scottish Highlands, and under the name of knob-berries and knot-berries the fruit is gathered in great quantities by the inhabitants of those districts. They have an agreeable flavour, and form a useful article of diet. This plant is one of the smallest of the genus, never growing more than 8 or 10 inches high. *Rubus idæus* (Common Raspberry, or Mount Ida Bramble) is well known for its crimson, edible fruit.

BRAMBLING, BRAMBLE FINCH, or MOUNTAIN FINCH (*Fringilla montifringilla*) is a bird allied to, and closely resembling in form and habits, the CHAFFINCH. In the male the head and back are deep black, the feathers margined by yellowish gray; the rump is white, tinged with yellow; the throat and breast light reddish-brown, and the sides spotted with black. In the female the colours are not so distinctly marked. The Bramble Finch is a winter visitor to Britain, coming over in considerable numbers from Sweden and Norway. It is an abundant bird in the north of Europe in summer, and descends in the autumn as far south as the Mediterranean in quest of winter quarters; it has also been met with in Japan, and is probably an inhabitant of Northern Asia. In this country the mountain finch frequents thick hedgerows from which habit it has probably obtained its name of Brambling and Bramble Finch; it is seen feeding in stubble-fields in company with the chaffinches, yellow-hammers, and other finches.

BRAMPTON, a town of Cumberland, situated in a deep valley on the road from Newcastle to Carlisle, 10 miles from the latter, and 311 from London. A town of 11,000

erected by the Earl of Carlisle in 1817. The old church, a part of which only is remaining, is situated $\frac{1}{4}$ mile from the town, on an eminence near the village of Lithington. The present church was built with part of the materials of the old one in 1788, and rebuilt in 1827. There are Dissenting chapels, a grammar-school, and some charities. There is an inscription cut in a rock a little to the S. of the town, which is attributed to one of Agricola's legions when in the vicinity in 207 A.D. Lanercost Abbey, built in 1116, is also near.

BRAN, the outer coat of wheat, rye, or other grain which is separated in grinding from the fine flour used for bread. Sometimes the whole, or a portion of the bran is retained in order to make *whole meal* or *brown bread*. Bran contains a large amount of nitrogenous matter, a pound being made up as follows:—

	Oz.	Gr.
Water.	2	92
Gluten and cerealins.	2	16
Starch.	8	128
Sugar.	—	70
Fat.	—	252
Woody pith or cellulose.	1	242
Mineral matter.	—	258

Flour when deprived of its bran loses much of its nutritive property; but on the other hand, it is also deprived of the indigestible woody fibre which has sometimes a disagreeable effect. Bran in its coarse condition acts upon the bowels as a mechanical irritant, and brown bread is often a very useful article of diet to persons troubled with constipation; but where there is a tendency to diarrhoea it should be avoided.

BRANCASTER, a village in Norfolk, 4 miles W.N.W. from Burnham, is supposed to have been the site of the *Brundabanon* of the "Itinerary" of Antoninus. Slight traces of the Roman camp can still be seen. The population in 1881 was 770.

BRANCHIÆ. See GILLS.

BRANCHING, in botany, is restricted to the production of members similar to the one producing them. For instance, when roots give rise to others, this is a case of true branching. On the other hand, when a stem puts forth leaves, though the process is physiologically the same, the differentiation of the new members has been carried to a very much greater extent than in ordinary branching, when the new members are similar to the stem.

New members are produced in either of two ways. In some cases the apex ceases to grow, and instead two new growing points are started side by side; this is known as *dichotomy* or *dichotomous branching*. In general, however, budding takes place laterally below the growing apex, and in this case the new member is either similar or dissimilar to the one which gave rise to it, whereas in dichotomy it is always similar. In all flowering plants bearing by lateral budding is the rule, but dichotomy is not common in the lower cryptogams.

BRANCHIOS TEGALS, in fishes, are bony rays supporting a fringe or membrane which helps to close the gill opening, and by its movements contributes to the direction of the currents of water which pass through the gills. These rays are articulated or attached by ligaments to the segments of the hyoid arch. They are of great length in the Anguiformes, in which they serve to support a membrane developed to form a large receptacle on each side of the head of this singular fish; into these receptacles the small noles are transferred, which the angler attracts with in reach of its mouth by the movable rod, line, and bait attached to the top of its enormous head" (Owen). The number of these rays varies; seven, as in the cod, are frequently found, but the blenny has two, and the carp three, while the Protopterus, a fish

allied to Lepidosiren, has but one; on the other hand, the Elops, one of the herring family, has no less than thirty. See GILLS.

BRANCHIOS TOMA. See LANCELET.

BRAN'ENBURG, a province of Prussia, derives its name from the mark of Brandenburg, the ancestral dominions of the reigning family; but the modern province is not quite coincident with the ancient mark. It is bounded N. by Mecklenburg-Schwerin, Mecklenburg-Strelitz, and Pomerania; E. by Western Prussia, Posen, and Silesia; S. by Silesia and Saxony; and W. by Saxony, Hanover, and Anhalt. Brandenburg lies between 51° 10' and 53° 37' N. lat., and 11° 13' and 16° 12' E. lon. Its area is 15,403 square miles.

The whole of Brandenburg is an almost uninterrupted plain, slightly elevated above the surface of the Baltic. Its soil is composed of river sand, in some quarters mingled with ferruginous earth, loam, or clay; and hence arises so great a diversity in its character that a general failure of crops is almost unknown, for a season unfavourable to one part is usually found proportionably beneficial to another. There are in the southern part a few mountain tracts, such as the Oderberge, the Schlagsdörferberge, and the Müggelsberge. The most fertile lands are along or near the courses of the rivers and the lakes, the latter of which are very numerous. There are several extensive heaths of drift sand, which battle most attempts to cultivate them. The climate is temperate, but variable.

Brandenburg is either traversed or skirted by two of the principal streams of Germany—the Elbe, which forms its N.W. boundary for a short distance; and the Oder, which drains the eastern districts. The Elbe skirts Brandenburg; only from Sandau to Donitz, and on the line of its right bank receives the Havel, Stepnitz, and Elde. The Havel is the most important river of the province in respect of its commercial advantages. The Spree, the Rhin, and the Dosse are affluents of the Havel. The east side of the province is watered by the Oder, which passes by Fürstenburg, Frankfurt, Küstrin, and Schwedt. Near Küstrin it divides into branches, which inclose many little islands. It is the common outlet for the water of the rivers Bobr, Neisse, Wartha, Netze, Mietzel, Welse, Randow, Finow, Stoberow, Hna, Donnitz, and Ucker.

The majority of the inhabitants are of German descent; some are also of Wend extraction, and not a few of them are of French. The population in 1883 was 3,400,000, the majority of whom are Protestants of the Lutheran or Reformed Lutheran Church.

The principal native productions of the province consist of corn of all descriptions, vegetables, fruit, hay, clover, &c., flax, hemp, tobacco, wine in small quantities, timber, domestic animals of the usual kind, game, fish, honey and wax, bog-iron, coals, lime, and gypsum. Potatoes, as well as other vegetables, are raised in abundance. More flax is produced than is sufficient for domestic consumption, but hemp is of limited cultivation. A little wine is produced, which is, however, of very indifferent quality. The crops of fruit are not adequate to supply the demand. The woods and forests yield many varieties of timber-trees, and much tar and potash. Great attention is paid to the rearing of domestic animals.

Brandenburg is poor in metals, and there are no regular mines in it; small quantities of bog-iron are obtained near Ruppın and in the Uckermark. There are very considerable lime-works near Rüdersdorf; much gypsum is raised at Spereberg; and large supplies of alum are obtained from Freienwalde, Gleissen, and Kanich. Coals are dug at Zilenzig; peat is plentiful, as well as potters' clay.

Brandenburg possesses considerable manufactures in many of the towns. The first manufactures were established by the Huguenot refugees, who received cordial assistance from the government, and were liberally seconded

by it in their outset. The woollen manufactures, which are the most important, are established in most of the towns in the old and new marks; those for the finer sorts of goods are at Luckenwalde, Züllichau, Kottbus, and Guben; kerseymeres and merino cloths are made in Berlin, where woollen yarns are spun on a large scale by steam machinery. The manufactures of linens, chiefly of the middling and coarser sorts, is extensively carried on in the Lusatian districts and the circle of Frankfort. Tanneries, paper-mills, sugar-refineries, and manufactures of tobacco, glass, porcelain, earthenware, iron, steel, copper, and gunpowder, are among the industrial establishments of the province. The Berlin iron ornaments have become particularly celebrated.

The trade of Brandenburg is greatly favoured by the multitude of its navigable rivers and canals. The main outlets are by the Elbe at Hamburg, and by the Oder at Stettin. All the chief towns of the province, such as Berlin, Frankfort on the Oder, Brandenburg, Potsdam, Küstrin, are the centres of considerable trade. A great many railways, starting from Berlin as a centre, traverse Brandenburg in different directions, giving rise to an important traffic.

For the purpose of civil government Brandenburg is divided into the two governments of Potsdam and Frankfort, and the capital, Berlin, forms a separate jurisdiction. It is subdivided into thirty-four circles.

The province of Brandenburg formed the nucleus of all the states now united in the Prussian monarchy. It was given in 1416 by Kaiser Sigismund to Frederick VI., count of Hohenzollern and burgrave of Nürnberg, ancestor of the present Emperor of Germany.

BRANDENBURG, an important town in Germany, and capital of the above province. It is the ancient *Brenaburch* or *Brennabor*. It stands at a distance of 38 miles W. by S. of Berlin by the railway from Berlin to Magdeburg, and has a population of 29,000. It is situated upon the Havel, which divides the old from the new town, with an island, constituting the "cathedral town," lying between them, on which stand the castle, cathedral church (with a fine old crypt), and college. Between these two quarters of the town lies a swampy district, which, from the houses being built upon piles, is called Venice. Each town is surrounded by a wall, but the new town has a rampart in addition. The old town has five gates, besides a smaller outlet for foot passengers; and the new four gates. The streets in the old town are narrow and crooked, but in the new town broad and straight. Brandenburg contains eight churches, a court of justice, gymnasium, several schools, and various branches of manufacture. There are manufactures of woollens, fustians, linens, stockings, paper, &c., with numerous breweries, distilleries, tanneries, and some boat-building; and it has a brisk trade both by land and water. Brandenburg has been several times besieged by Henry the Fowler, Albert the Bear, and Gustavus Adolphus. It was the birthplace of Julius von Voss. A bishopric was established in Brandenburg in 949, subject first to Mainz, and then to Magdeburg, but the heathen Wends seized the town, and retained possession until 1161. It was afterwards the capital of the electorate of Brandenburg.

BRANDENBURG, ELECTORATE OF. The first known inhabitants of this province were the Suevi, a very warlike tribe. When the Suevi and the Lombardi invaded Italy in the decline of the Roman power, the Slavonians invaded and settled in Brandenburg. The Slavonians and the Franks subsequently contended for the possession of Brandenburg. In 789 it fell into the power of Charlemagne, under whom and his successors Brandenburg was governed by counts under the empire. Many contests took place between the Slavonians and their Frankish conquerors. In 1144 Albert, count of Anhalt, became the first margrave of Brandenburg. His line lasted till 1320,

from which date till 1417 Brandenburg was full of anarchy. Frederick of Nürnberg was made elector of Brandenburg in 1417; and, being a prince of ability, he laid the foundation for the future prosperity of his dominion. Most of his successors ruled with judgment. Joachim II. introduced the reformed religion into Brandenburg in 1535. No interruption of the line took place until 1618, when the duchy of Prussia came into the same hands as the electorate of Brandenburg. From this date the history of the latter merges into that of the present Kingdom of Prussia.

BRAND'ING, a mode of punishment formerly used in England, but which has now become obsolete. In its earliest form it was inflicted by means of a hot iron having a letter or mark upon the end, which was pressed against the skin. For a long period all criminals who were entitled to benefit of clergy were punished by being burned or branded on the hand. Branding was also inflicted in cases of theft, brawling in church, and other offences. There is an allusion to this mode of punishment in Shakspeare's "Henry IV., 2nd part, Act iv., scene 2. It was finally abolished in the case of felonies by the 9 Geo. IV. c. 31; but it was used in the army until a recent period in the case of those found guilty of desertion. In the latter case the offender was marked on the left side, two inches below the armpit, with the letter F. It was required that the letter should be not less than an inch long, and it was marked by picking the skin with needles, and afterwards rubbing in Indian ink, gunpowder, or other dark substance. Though called branding, it was really a process of tattooing.

BRANDON, a small market-town in Suffolk, 17 miles N.N.W. from Bury St. Edmunds, 100 Hethford, and 88 from London by the Great Eastern Railway. It is a neatly built town of three principal streets, on both sides of the Little Ouse, where it separates Norfolk from Suffolk, and which is here spanned by a substantial stone bridge. It has a considerable trade in corn, malt, coals, and timber, and there are some saw-mills and small manufactures of whitening. Near the village are some extensive rabbit warrens. Brandon at one time had flourishing manufactures of gun-flint—the work of the British army having been exclusively supplied from this town. Brandon comprises a square outwork in the vicinity, is supposed to be the *Brannium* of the Romans. The Duke of Hamilton and Brandon derives his English title from this town.

BRANDY is the alcohol or spirituous portion of wine separated from the aqueous part, the coloring matter, &c., by distillation. The word is of German origin, and in its German form, *branntwein*, signifies burnt wine, or wine that has undergone the action of fire. It is prepared not only by distilling the wine itself, but also by fermenting and distilling the *marc* or residue of the pressings of the grape, which has a more acid flavour than that obtained from wine.

Brandy began to be distilled in France about the year 1343, but it was prepared only as a medicine, and was considered as possessing such marvellous strengthening powers that the physicians termed it *eau de vie* ("the water of life"), a name it retains. The celebrated brandy of Cognac, a town of Champagne, and that brought from Andraye, seem to owe their excellence to being made from white wine so fermented as not to be impregnated with the acid of the skin of the grape. Like other spirits, brandy is colorless when recently distilled. By mere keeping, however, it acquires a slight colour, which is much increased by keeping in casks, and is made of the required intensity by the addition of burned sugar.

A second-class brandy is obtained from the red wines of Portugal, Spain, &c., as also from the scrapings of wine casks and vats, the deposits in wine bottles &c. Now all the French brandy is distilled by farmers in small stills. The vines cultivated for its manufacture are allowed to grow to greater luxuriance than those used for wine making, and run along the ground, whence they acquire strength,

whilst the earthy flavour which is inseparable from wine produced from creeping vines is dissipated in the process of distillation.

Brandy is distinguished from other ardent spirits by its light cordial and stomachic properties, and it is usually the form in which alcohol is administered in medicine. Taken internally, it serves to powerfully excite the action of the heart in cases of suspended animation, and in the low forms of fevers and other exhaustive diseases of the body it is among the most valuable of the remedies at the command of the physician. It is also very frequently used to relieve griping, windy pains in the stomach and bowels, and to alleviate the discomfort caused by sea sickness. Applied externally, it serves to harden the skin. When set on fire for a moment or two, it is known as *burned brandy*, and is used in that form as a good household remedy for diarrhœa.

It must be observed, however, that brandy is largely adulterated, and some forms of adulteration are of a very injurious character. In England large quantities of grain spirit are coloured and flavoured and sold as brandy, while abroad potato spirit is used for the same purpose. In the former case the distinguishing qualities of the wine spirit are wanting; in the latter there is generally the presence of the pernicious fusel oil.

The customs duty on brandy in the United Kingdom was reduced in 1816 from £1 2s. 10d. to 10s. per gallon; in 1860 it was further reduced to 10s. 5d., at which rate it now stands. The quantity imported in 1884—nearly all from France—amounted to 2,382,897 gallons, valued at £1,066,430.

BRANKS (Teutonic, *pranghe*, a bridle), an instrument used in former times for the punishment of scolding women, popularly named the "scold's bridle." The branks at first consisted of a loop of iron opening behind at the sides, and fastened by a strap with a padlock at the back. A plate within the front of the loop projected inwards, so as to fit into the mouth of the offender. Some difficulty was found in keeping the instrument in its place, and it therefore received the addition of a curved band of iron passing over the forehead. In the progress of time, by the multiplication of its loops and bands, the instrument took the form of a conical cage of iron, with a door behind, the front being fashioned into a rider's neck, with holes for mouth, nose, and eyes. The offender was driven through the streets with the branks over her head, the iron forced into her mouth often making it bleed profusely. It was used in some parts of Lancashire as recently as the early part of the present century. Specimens are preserved in Oxford, Edinburgh, &c. Plot (1696-99), in his curious "*Natural Histories of Oxfordshire and Staffordshire*," describing the public branks of Walsall, commends it as preferable to the more common punishment for scolds, the *Duckin's Stool*, because, says he, "the latter not only takes away the health of the woman by repeatedly forcing her mouth open, but between each dip *alloweth free play to her tongue*, whereas the branks is harmless, and enforces perpetual silence, bringing shame for the transgression, and no more."

BRANTFORD, capital of the county of Brant, province of Ontario, Can. ad., stands on the Grand River, about 24 miles from Hamilton. Its chief industries are the manufacture of a saw-mill, agricultural implements, and window blinds. A canal connects the town with Lake Erie. It has several churches, an orphanage, and numerous banks.

BRANTÔME, the common designation of the French writer Pierre de Bouchelles, who was made lord abbot of Brantôme in Guienne in his sixteenth year. He never took orders, but was a courtier and soldier all his life. Very little is known of the life of Brantôme. He appears to have been born about the year 1510. Having served his

apprenticeship in arms under Francis of Guise, he eventually obtained two companies of foot from Charles IX. That king made him a chevalier of the order of St. Michael, and also gave him the office of one of his gentlemen-in-ordinary, and a pension of 2000 livres a year. Brantôme accompanied Mary Queen of Scots, widow of Francis II. of France, to Scotland, and served in Africa and Hungary against the Turks. After the accession of Henry III. he appears to have taken his leave of the court, and retired to his estate of Richemont in his native province, where he died in 1614.

By his last will he charged his heirs with the publication of his works (or "*Memoirs*," as they are often collectively called), ordering that the necessary funds should be provided from the revenues of his estate; "though I have known," he added, "the booksellers pay for liberty to publish books not half so interesting." Brantôme wrote neither history nor personal memoirs. His work is a collection of desultory biographical essays, describing from actual life the ways and acts of an aristocracy which combined extraordinary luxury and corruption with wit, ability, and a keen interest in war and affairs. The chief portions of his work are the "*Vies des grands Capitaines*" and its counterpart, the "*Vies des Dames illustres*," the famous "*Dames galantes*," &c. His ideals are BAYARD and MARGUERITE DE VALOIS. Brantôme's anecdotes are often scandalous, but this is the result of his honesty. Like Pepys, he seems to have simply written down whatever he thought. His works appeared in 1666. The most complete edition of Brantôme is that of 1749, in fifteen volumes 12mo; but Buchon's (two volumes, Paris, 1839) is the usual authority.

BRASDÔR'S OPERATION, one of the chief means adopted in surgery for the cure of aneurism, consists in tying the artery between the tumour and the heart, and so cutting off the current of blood. There are many places, however, in which aneurisms form where such treatment is impossible, but where the artery can be safely reached beyond the aneurismal sac; and it was suggested by Brasdor that these might be cured by tying the artery on the side furthest from the heart. When there is any large branch given off between the aneurism and the point tied, the operation will fail to effect a cure; but in other cases it has been attended with success.

BRASENOSE COLLEGE, Oxford. The precise date of the foundation of this college is not known. The plan for it was concerted in 1597-8 between William Smyth, bishop of Lincoln, and Richard Sutton, Esq. (afterwards Sir R. Sutton), of Prestbury in Cheshire. The first hall, from which the college took its name, was of great antiquity. In the thirteenth century it was known by the same name, believed to be owing to the circumstance of a nose of brass affixed to the gate. The true derivation of the name is, however, *brasehuis*, a *braserie* or brew-house, the original purpose served by the hall, no doubt. This having got corrupted to Brasenose, the brass nose was affixed to the gate to justify it—a very clear case of the logical fallacy of *post hoc ergo propter hoc*. It appears that a society was formed almost as soon as the college was projected. We find a principal in the month of June, 1510. The charter of foundation granted to Bishop Smyth and Richard Sutton, Esq., is dated 15th January, 1511-12. According to the charter, the society was to consist of a principal and sixty scholars, to be instructed in the sciences of sophistry, logic, and philosophy, and afterwards in divinity; and they might possess lands, &c., to the yearly value of £300 beyond all burdens and repairs. The number of fellows, however, was not completed until their revenues, by being laid out on land, became sufficiently productive.

In addition to the bounty of their two founders, this society soon obtained numerous benefactions. By an ordinance of the commissioners under the Act 17 & 18 Vict.

c. 81, all the fellowships are now open. There are a large number of scholarships and exhibitions of different values. The Bishop of Lincoln is visitor.

Scholarships and exhibitions were added at different times by various benefactors. Sarah, duchess-dowager of Somerset, founded eighteen scholarships for persons educated at the schools of Manchester, Marlborough, and Hereford, and also four scholarships restricted to the first of the above-named schools, all at present tenable for five years, unless vacated by other preferment. In failure of candidates properly qualified from the schools, these scholarships are now open to general competition. Some open scholarships of the value of £80 per annum, and tenable for five years, have recently been established. William Hulme, of Kearsley in Lancashire, founded in 1691 four exhibitions, now increased to twenty under a scheme framed by the charity commissioners and approved by the queen in council in 1881. Twelve are called junior exhibitions, and are awarded after a competitive examination. They are of the annual value of £80, and are tenable in Brasenose College for four years. Eight are called senior exhibitions, and are awarded in ordinary cases, after competitive examination, to members of the college who have resided for not less than six nor more than twelve terms, and who have been placed in the honour list at moderations. Their annual value is £130, and they are tenable for four years.

The original edifice of Bishop Smyth and Sir Richard Sutton is still visible in the large entrance quadrangle; a third story was constructed over a great part of it, with dormer windows, &c., about the time of James I., for the accommodation of additional members. The hall and tower gateway, however, retain much of their former grandeur and picturesque effect. The present frontage of the college occupies nearly the whole of the western side of the Radcliffe Square; and the site of it extends southward to the High Street. The hall or refectory, on the south side of the principal quadrangle, is lofty and well proportioned. The well-known gate-house was thoroughly restored in 1865.

The first chapel used by the society was a small oratory over the buttery, since converted into rooms. The foundation stone of a new chapel was laid in 1656, and it was finished in about ten years. The new library, built over the cloister, between the chapel and the south side of the inner court, was finished in 1663. The design of this building is attributed to Sir Christopher Wren. The interior was refitted in 1780. (*Oxford University Calendar*, 1883.)

BRASSICA, a genus of cruciferous plants, comprehending the cabbage, cauliflower, brussels sprouts, rape, turnip, colza, mustard, and the like. This genus is distinguished from other CRUCIFERÆ by the terminal stigma, the long siliqua dehiscing through its whole length, and the seeds being in a single series and not winged. The principal species are described under their respective heads. They are natives of the Mediterranean region, temperate Asia, and South Africa.

BRASIDAS. The first mention of this eminent Spartan occurs in the first year of the Peloponnesian War. In the third year of the war he was associated with Cnemius in the command of the Peloponnesian fleet; in the seventh year he commanded a ship in the armament which attacked the fort of Pylos. Soon after a request for help was preferred to Sparta from some cities in the Chalcidian peninsula which had thrown off their allegiance to Athens. The Chalcidians requested that Brasidas might be the leader. In the eighth year of the war (B.C. 424) Brasidas led his army, consisting altogether of about 4000 soldiers, to Thessaly, where he joined Perdicaus of Macedonia. The first-fruits of his appearance in Chalcidice were the revolt of Acanthus and Stagirus from Athens, and this was followed by the acquisition of Amphipolis on the Strymon. In the spring of B.C. 422 the Athenians sent out Cleon to

assume the command, who speedily undertook the siege of Amphipolis. Brasidas superintended the defence. A battle ensued in which the Athenians were completely defeated, but Brasidas himself received a mortal wound. He was buried in the public place of Amphipolis at the public expense, and it was ordained that he, instead of Agnon the Athenian, should thereafter be honoured as the founder of the city and colony.

BRASS (Latin, *æs*) is an alloy of copper and zinc which, from the remotest antiquity, has been extensively applied to useful and ornamental purposes. It was made long before zinc was obtained in its metallic form, by exposing grain or beam copper, which was produced by pouring melted copper into water, or copper clippings, to great heat in crucibles with calcined and powdered alumina, a native carbonate of zinc, and charcoal; but in 1781 James Emerson obtained a patent for making brass in a more direct way, by melting together its constituent metals. By the mode now generally practised ingots of copper are put into a crucible and melted, zinc is cautiously dropped in, an iron rod is used to stir the molten metals, and the brass is poured into sand moulds. The proportion of the two metals varies according to the kind of brass to be made, but is usually about nine of copper to four of zinc. Cheap imitations of gilt articles, such as prince's metal, tombac, pinchbeck, similor, Mannheim gold, &c., are all varieties of brass with the copper in larger proportion than usual to the zinc. Tombac is beaten into leaves $\frac{1}{16}$ of an inch in thickness, and known as Dutch metal. The general properties of brass are, a fine yellow colour, susceptibility of a high polish, and being easily susceptible of being acted upon by the air. It is very brittle at cold, but malleable and ductile when cold. Its specific gravity is greater than that deducible from the specific gravities of its constituent metals. It is more fusible, more conductive of heat, and harder than copper. The facility with which it may be cast, and turned in a lathe, or otherwise worked, renders it particularly useful in the construction of mathematical instruments, and the smaller parts of machinery. In casting it takes delicate impressions from the mould, and brass wire is extensively used in pen-making, and for various other purposes. *Latton* is a name sometimes given to thin sheets of rolled brass. Many articles of brass are now coated with silver metals by means of the electro-metallurgical process, and brass in turn is used for electroplating iron and various other metals. Iron may be thus coated by dipping into molten brass, which deposits a film susceptible of being polished. Once once and a half of brass can be made to cover a square foot of iron as a protection against rust, at a cost of 2s. 6d. per lb. of brass deposited, wrought iron taking the brass better than cast.

It is computed that Birmingham makes and works up about 50,000 tons of brass annually, worth some metal £2,500,000, irrespective of the extra value for fishhooking into numberless forms for use and ornament. The export of brass from the United Kingdom amounts to between £300,000 and £400,000 per annum.

A variety of brass known as Muntz's metal was patented in 1832, and is largely used for sheathing the bottoms of ships. It contains 60 per cent. of copper and 40 of zinc; the metal is cast into ingots, and then rolled into sheets while hot.

BRASSES, MONUMENTAL, are engraved brass plates, representing the effigies of deceased persons, often surrounded by elegant ornaments and heraldic devices, or surmounted by Gothic canopies, embedded in stone slabs, which usually form part of the pavement of a church, but are occasionally laid upon altar-tombs, or set up against a wall. They form a very interesting portion of the monumental remains of this country, and present many valuable illustrations of customs, and also, in their quaint inscriptions, which are usually in Latin, and in the best specimens

in an elegant Gothic letter, of the peculiar character of the piety of our ancestors. There are about 4000 still existing in the various churches of England, and some of them date from the thirteenth century. The earliest complete specimen is that of Sir John d'Aubernonn, at Stoke Dabernonn, and the best known is that of Sir Roger de Trumpington, at Trumpington, in Cambridgeshire. There is also a brass on the tomb of Walter de Meiton in Rochester Cathedral, which was probably placed there soon after his death, which took place in 1277.

BRAVURA, in music (the literal meaning in Italian being "courage," "intrepidity"), is an air consisting chiefly of difficult passages, such as songs with florid runs in which many notes are given to one syllable, or instrumental solos crowded with technical difficulties to test to the very utmost the skill and spirit of the performer. Most bravuras, as being mere media for display, are comparatively poor compositions. Sometimes, however, in the hands of the greatest masters, bravuras are elevated to the highest rank. Many, if not most, violin concertos have a bravura movement; and in vocal music Handel's "Let the bright seraphim," or "Rejoice greatly," Mozart's music for the Queen of Night in the "Zauberflöte," and similar pieces, are splendid exceptions to the rule.

BRAWLING IN CHURCHES is in English law a offence against public peace. In former times it was punished with great severity, an offender who struck a blow with his hand being excommunicated, while one who drew and attempted to use a weapon became liable, in addition, to having one ear cut off, or if he had no ears, to being branded with the letter F on the left cheek. These penalties were repealed by 9 Geo. IV. c. 31, s. 1, but they had fallen into desuetude long before. The law on the subject is now regulated by 23 & 24 Vict. c. 32, which provides that any person guilty of riotous or indecent behaviour in any church in England or Ireland, or in any churchyard, burial-ground, chapel, or place of religious worship, publicly ordered, or who shall wilfully any preacher or minister to be called to preach the Gospel, shall on conviction be liable to a penalty not exceeding £5 for each offence, or in default of payment to two months' imprisonment. Such persons may be immediately apprehended after the offence by a constable or churchwarden.

BRAWN, the name given to a young bear after it has been weaned. It is considered to designate a preparation made of the flesh of swine, which has been deprived of the bones and made up into a roll with the addition of spices and the flesh from a trotter. It is prepared by boiling and pressing, and is usually eaten either as a roast, or as a cold dish. Whitehead has the reputation of making the best brawn in England.

BREAST-Y, the name given to several forms of disease which, among sheep, the two most generally known of these being a form of indigestion which terminates in suppuration and acute inflammation of the bowels, and another which arises from a plethora of blood. The first is often preceded by the change from a moist juicy diet to food of a hard and dry description, as when the grass on the mountains is covered with snow and the sheep are compelled to browse upon the tops of the heather, &c. The signs of this disease are great restlessness and uneasiness, the eyes being red and heavy, the mouth parched, and the belly swollen. The other form of the disease is most prevalent in spring, when sheep are being fattened for the market. Those affected are generally suddenly seized with pain, become excited, and get away from the rest of the flock. There is a difficulty in breathing, which is followed by convulsions, and the animal dies within a few hours. When a shepherd observes these symptoms set in he generally kills the sheep at once, and the flesh, after being cured and lugged, is termed braxy-mutton, and is eaten with a relish by the peasantry. Its use does not appear to be

followed by any injurious consequences in Scotland, but in warmer climates the eating of such flesh is often followed by disease of a serious character. Care in the matter of diet, and shelter in severe weather from undue exposure, are the chief means of preventing these diseases, treatment after they have set in being almost impossible. Swine while being fattened sometimes suffer from the form of braxy last described, and when seized with it generally die within a few hours.

BRAY, a seaport and market-town, in the county of Wicklow, Ireland, 16 miles N. by W. from Wicklow, and 12 miles S.E. from Dublin, stands on both sides of a rivulet called the Bray, at its entrance into the Bay of Bray. The town, surmounting the steep banks of the rivulet, over which there is a stone bridge, extends about a mile in length. It is a very pretty place, in an exceedingly pleasant neighbourhood—being surrounded by hills on all sides except that towards the sea. It is much resorted to for bathing by the inhabitants of Dublin and other parts of Ireland, and is consequently well provided with hotels, inns, lodging-houses, and other means of accommodation. There is a broad esplanade fenced off and laid down in grass for about a mile along the shore. Several ranges of good houses have also been erected. The principal public buildings are—the parish church, a spacious Roman Catholic chapel with a handsome tower, a Presbyterian meeting-house, a Wesleyan chapel, several schools, two banks, a large range of Turkish baths, fever hospital and dispensary, court-house, and a fine railway station. The brewing of beer, ale, and porter is the only manufacture carried on. The river Bray, which is famous for its trout, divides Wicklow from the county of Dublin, so that part of the town belongs to the latter. There is railway communication with Dublin (by two separate lines), Wicklow, and Gorey and Enniscorthy in Wexford. The local affairs are regulated by twelve commissioners.

BRAY, SIR REGINALD, K.G., the reputed architect of Henry the Seventh's Chapel at Westminster, was son of Sir Richard Bray, one of the Privy Council to Henry VI. He took an active part against Richard III., and was knighted on Bosworth field by Henry VII. Subsequently he received the Garter and was made lord high treasurer, amongst other dignities. In 1467 he was speaker of the House of Commons. His claim to the honour of designing so fine a work has been disputed, but on very slight grounds. The first stone was laid on the 18th of January, 1502, and he died on the 5th of August in the following year. He erected the tower of this other singularly beautiful structure, St. George's Chapel at Windsor, where he was buried.

BRAY, THE VICAR OF, is the name of a well-known national song referring to the political changes of the seventeenth and eighteenth centuries. It appears that the person who held the living of Bray in Berkshire, in the reigns of Henry VIII., Edward VI., Mary, and Elizabeth, was possessed of a very accommodating conscience, having been twice a Roman Catholic and twice a Protestant. Upon being taunted with his inconsistency he defended himself by saying he had always adhered to one principle, which was "to live and die vicar of Bray." The song represents the vicar as living in the reign of Charles II. and his successors, but the above is the account of the matter in Fuller's "Church History."

BRAZIL. The enormous territory of the empire of Brazil, the only American monarchy, very nearly equals that included within the boundary of the United States, or is not far short of Europe in extent. It is by far the most important of the divisions of South America in area and population, as well as in prosperity and stability. It is bounded by the Atlantic coast for about 4000 miles, from Guiana in the north to Uruguay in the south, and reaches inland for nearly 2500 miles, the vast extent of its inner boundaries bringing it into contact with all the countries of South America except Chili. The northern limit is

marked by the river Oyapok, which divides Brazil from Guiana in $4^{\circ} 22' N.$ lat., while the most southern boundary line cuts the Lake of Mirim, in $32^{\circ} 30' S.$ lat. The total area is upwards of 3,288,000 square miles.

Physical Features.—This vast territory presents two contrasted regions. First, the wide low-lying and humid forest-plain of the Amazon river in the north—one of the most extensive on the globe. The extremely level character of the great northern plain may be judged of by the fact that the banks of the Amazon, where it enters Brazil from Peru at Tabatinga, more than 1500 miles in a direct line from the Atlantic, are not more than 250 feet above the ocean level; and a continuous navigation is afforded by its tributary the Rio Negro, the natural canal of the Casiquiare, and the Orinoco, to the northern coast of the continent. The second region comprises the uplands in the south, which are traversed by radiating hills and mountain ridges, and which present wide grass-plains between woods and bush-covered country. The highest mountain ranges of Brazil rise near the Atlantic border of the south-eastern uplands, and the heights nearest the sea are thence named the Serra do Mar, and a portion of this maritime range, called the Organ Mountains, which rise behind the beautiful Gulf of Rio de Janeiro, has summits which reach up to 7500 feet; but the greater part of the table land is much less elevated, and there are nowhere within the territory of Brazil such immense heights as those of the Andes, which rise beyond its western border.

Rivers.—Owing to the great mountain chain which traverses the coast of the Pacific to the westward of Brazil scarcely any of the surface drainage finds its way to that ocean, but is conducted through vast plains to the Atlantic. First of the many enormous rivers of Brazil is the Amazon, justly called the Mediterranean of South America, and the largest stream of the globe in every respect, affording, with its great tributaries, free navigation over not less than 50,000 miles within Brazilian territory, and draining an area of about 2,270,000 square miles. It descends from the higher parts of the Peruvian and Bolivian Andes, pursues a general direction from west to east, and after a course of 3900 miles enters the Atlantic not far under the equator. While perpetually fed from the snows of the mountains, it flows through a region more humid than that of any other part of the world of equal extent. In the wet season the rain pours down in torrents; the drops are of enormous size, and fall with a violence which Europeans who have not witnessed it are unable to conceive. Hence is formed that vast flood, which is 50 miles broad at the mouth, never less than 4 miles wide through the last 150 miles of its course, the freshness of which is perceptible at a distance of 500 miles out in the ocean, while the depth is so great that large vessels may go up the channel for 2000 miles, and still be in 40 fathoms of water. Yet, flowing through a country very scantily occupied, by rude tribes, there are fewer vessels upon its surface throughout the year than appear every hour of the day on the bosom of the Mississippi. But it may be regarded as the river of the future, opening a splendid field for enterprise from the exuberance of nature on its banks, and most admirably adapted for navigation, the powerful current facilitating it downwards, whilst this obstacle to the ascent is relieved by the prevailing wind, which is uniformly contrary to the course of the stream. The tributaries of the giant stream are on a scale of corresponding magnitude, varying from 600 to 1800 miles in length; while into the great tributaries themselves there pour large numbers of feeders, few of them less than twice the length of the Thames. The main tributaries to the Amazon from southward are the Jurua, Purus, Madeira (1800 miles), Tapajes (1000 miles), and Xingu (1080 miles), all of them rivers of the first magnitude. From the north they come to it the Japura and the Rio Negro (1400 miles), which is joined by the remarkable channel of the Casiquiare to the basin of

the Orinoco. The Tocantins (1500 miles), with its great tributary the Araguay (1000 miles), flows northward through Brazil to the Gulf of Para, close to the mouth of the Amazon. The Paranahyba and San Francisco (1300 miles) are great rivers which flow from the uplands directly to the Atlantic. The Purana and the Paraguay, the rivers which join to reach the sea by the La Plata Gulf, both take their rise in Brazilian territory. Some of these rivers are interrupted by boisterous cataracts, while others encircle large islands, especially the Araguay, in which is Santa Island, the largest river island in the world, 200 miles in length.

Brazil has two distinct climates; it is hot and damp during the wet season in the torrid zone, temperate and dry beyond those limits. From Rio to the extreme south the heat sensibly diminishes. The rains usually last from November to June. At Rio thunderstorms used to occur almost every afternoon from December to March, until a few years ago, when this regularity of storm ceased; in consequence, it is supposed, of the destruction of the surrounding forests. To this falling-off in the rain was attributed the prevalence of yellow fever in 1852, which for some time carried off between 100 and 200 persons daily. Since then trees have been extensively planted; but in the plains about Rio they do not grow to any size, and judging by the experience of recent years, they do not seem to have had any very considerable effect in the prevention of yellow fever. J. A. de Assis, in his "Notes on Brazil," says, that the moisture which is suspended in the air at certain seasons is most trying to European constitutions; there is a heavy weight in the lightest clothes, the energies are paralyzed, healthy evaporation is checked, the memory fails, and a fretful languor makes even the involuntary contractions of purely vegetable existence disagreeable. This lasts only for a portion of the year; but even in the most healthy years Europeans are liable to fevers of all kinds—yellow fever, typhoid, or typhoid—and one is always subject to a rheumatism from the dampness of the atmosphere.

Another plain, south-eastward of the plain of the Amazon, is 600 miles long by 100 broad. Its climate is much more European, and its soil capable of yielding more valuable crops. This plain has its own system of rivers, which are discharged into the Atlantic by the Paranahyba, about 700 miles long. Eastward of this plain, and separate from it by the Serra Itapipetã, is a mountainous country, extending to the Atlantic, and exhibiting a diversified surface of mountains, small mountain plains, valleys, and short rivers. Cap. Angustulo, in $8^{\circ} 20' S.$ lat., $34^{\circ} 58' W.$ lon., at the eastern extremity of this district, is near the point where the great Atlantic current divides into its north and south branches; and the vicinity of this current gives rise to a kind of coolness in the climate of the coast.

Productions and Industry.—In richness and variety of vegetable products, favoured in their growth by its tropical climate and copious rains and rivers, Brazil surpasses almost all other parts of the world. The Selvas or "forest" plains of the Amazon form the densest and most extensive woodland on the surface of the globe. There are a hundred species of palms, and the host of myrtles perfume the air with their exhalations. No language can adequately describe the glory of the Brazilian forest; the variety of the trees bearing brilliant blossoms; the contrast of their colour and size, the latter often colossal; and the thickets formed by the creepers hanging from branch to branch, with the endless diversity of the flowering plants. The forests supply useful timber in profusion, as well as dyewoods and gums, such as the valuable indiarubber, the cocoa, sage, and wax palms, nuts and fruit-trees of many kinds, and the medicinal cinchona abundant; and agricultural cultivation flourish the coffee plant, sugar cane, cotton, rice, manioc, and banana. The parent tree of the well-known Brazil nuts (*Bertholletia excelsa*) answers to its name, rising commonly to the height of 100 feet, and being

2 or 3 feet in diameter. The nuts are inclosed in a shell half an inch thick, hard as iron, and so neatly packed together that when once disturbed no human art could possibly reinsert them all. They are the castanhas or chestnuts of the natives, an article of food with them, and greatly relished also by the monkeys. The staple production of Brazil for export is coffee. The empire supplies three-fourths of all the coffee used in the world. In sugar-growing Brazil is only second to Cuba. Large numbers of people are employed in forestry and in mining, but agriculture and stock-raising, and tending cattle, horses, and mules upon the vast grass-plains of Southern Brazil, employ a much more considerable section of the inhabitants.

The cultivated lands are only a small part of the whole surface. Except in the immediate vicinity of the larger towns of Rio, Bahia, and Pernambuco, the farms occur at great distances from one another, even in the neighbourhood of the sea, and still more so further inland. Agriculture is carried on in a very rude manner. The forest-trees are cut down and burned on the ground; the soil then gives rich crops for several years without manure. When it is exhausted, it is abandoned, and another piece of ground is treated in the same way. The aborigines of Brazil were not entirely unacquainted with agriculture, but it was limited to a few articles, such as maize, bananas, manioc, and cassava. Since the settlement of Europeans many other plants have been added to the list, including rice, wheat, potatoes, the cocoa-plant, the maté-plant, coffee, sugar, cotton, tobacco, indigo, ginger, pepper, cinnamon, cloves, vanilla, sassafras, castanhol, copaiba, copal, various fruits, and also various dye plants, and timber-trees. The wheat-culture has not been very successful; nor do the table vegetables of Europe thrive satisfactorily, chiefly on account of the attacks of ants and other vermin.

The pastures are extensive, and one of the principal sources of wealth is in the domestic animals. The best pastures are to the south of 20° S. lat., in Rio Grande do Sul, San Paulo, and the Southern districts of Minas Geraes. The herds of horned cattle are here immense, and their produce, consisting, besides live stock, of hides, jerked beef, tallow, horns, and horn-tips, is exported in great quantities. As soon as the animals are skinned the hides are spread on the ground, slightly salted, and dried in the sun. The flesh is cut into thin slices, salted, and dried in the air, for consumption in the northern provinces. Butter and cheese are made in small quantities. Horses of different breeds are rather numerous in Brazil.

Among the wild animals are jaguars, panthers, tigers, porcupines, deer, hares, monkeys, armadillos, agoutis, wild bears, bats, vampires. Of birds, there are ostriches, toucans, parrots, ravens, horned-owls, pigeons, &c. The reptiles and insects of Brazil are most numerous; and the rivers are as abundantly supplied with fish as almost any country in the world. Some of these fish yield oil, while others afford an immense supply of food for the inhabitants.

The Brazilians produce many useful substances from the nature by which they are surrounded. They prepare sperm-candles from some of their fish; they salt and dry many of their larger fish, to serve as a store of provisions; they make sausages from the flesh of the manati, a peculiar kind of fish; they produce a fatty substance from the eggs of turtles by roasting; and they fry one species of ant as an article of food.

Minerals. The mineral wealth of Brazil is very great. Gold is found in many parts, especially in the mountains round the head of the basin of the San Francisco river. The province of Minas Geraes, or "General Mines," is the part most prolific in mineral resources of every kind. Probably no region of the world is richer in precious stones, including diamonds, emeralds, rubies, topazes, beryls, and garnets. In Minas Geraes the most valuable

topazes are found in the sands and mud deposited by the upper waters of the river San Francisco and its feeders. The first diamonds were obtained in the year 1710, by the miners in washing for gold. They were preserved as pretty stones, deemed of no more value than beads, till recognized by an official who had been in the East Indies as diamonds of the purest water. This district has been one of the richest on the earth in the costly gems; and the province of Matto Grosso is scarcely inferior to it. It was the treasures of Minas Geraes which enabled an extravagant governor at Ouro Preto to shoe his horses with gold in solemn religious processions, which enriched the reigning dynasty with £3,000,000 worth of diamonds, and set on the Brazilian and Portuguese diadems those two famous jewels, the Southern Star and the Abacete, rivalling the glories of the Koh-i-noor. Iron is very abundant, in some places there being whole mountains of ore. Very few traces of silver have been found, but copper, tin, and quicksilver are plentiful. Platinum occurs on the banks of the Rio Abacete, a tributary of the San Francisco, and in some other places. Lead and cobalt are more common.

Population.—The empire is the only country in America where slavery legally exists; but the slave trade is prohibited, and all are being gradually emancipated. The children born of slaves are free, and in almost every province societies exist which give facilities to slaves to purchase their freedom. In 1883, when the population was estimated at 12,000,000, it was found that the number of slaves had diminished to less than 750,000.

The population consists of whites, chiefly of Portuguese descent, negroes, aboriginal Indians, and mixed races. While Brazil remained a colony of Portugal but few women accompanied the emigrants to South America. The earliest European settlers intermarried and mixed with Indian women; and afterwards an extensive intermixture of race occurred with the Africans who were bought for slavery. Colour has no influence upon social standing, and persons of every shade are eligible for official employment and political privileges.

The aborigines are found in most of the provinces, but under different circumstances in the interior and the maritime districts. In the upper part of the basin of the Amazon there are tribes in a condition of wild independence, retaining the barbarous customs and superstitions of their ancestors, as if the foot of civilized man had never trod the soil. Others, more contiguous to the chief settlements of the whites, have been partially civilized, brought into subjection to regular government, and are very strongly protected by the laws. Imprisonment has been inflicted upon the white man for striking his Indian neighbour. These natives, though disposed, like all the other members of the race, to look with aversion upon settled industry, yet till the soil, manage the boats which bring down produce on the rivers, compose part of the national army; and traces of intermarriage with them are observable in some of the town families. They make baskets, boxes, and india-rubber shoes neatly, and are unequalled in the production of feather-work.

The established church is the Roman Catholic. But while sustained by the state, the hierarchy are controlled in the exercise of many important functions by the civil government; and toleration is enjoyed by other communions, subject to the restriction of not building steeples and ringing bells. Official statements are scarcely credible respecting the ignorance, sloth, and vices of the clergy, who are regarded with contempt by the better classes, and have recourse to shows and festivals to maintain influence with the populace. These are duly announced in the newspapers, in connection with some amusement to collect a crowd, as "Brilliant Horse-racing! after which there will be a Te Deum and Magnificent Fireworks!"

Several papers of large size, well printed on good paper, appear daily in the capital, without exception being made

in favour of Sunday. There are two universities of law, one at San Paulo and another at Pernambuco; two medical universities, one at Rio and another at Bahia; an imperial academy of the fine arts; a geographical and historical institute; and public instruction has an official superintendent. The people are in general keen politicians, and take a lively interest in the elections, which, by the constitution, are held in churches. This regulation the framers of it thought would give solemnity to the proceedings. But during severely-contested elections, when party spirit has run high, a free use has been made of the metal candlesticks and statues, in the place of legitimate arguments. This, however, is about the full length to which party strife has gone, for Brazil, with its stable constitution and settled, orderly government, stands in marked contrast to the ceaseless strife and revolution prevalent in most of the more democratic states upon her border. Though not, however, frittering away his strength in revolutions, the Brazilian has the unfortunate failing of relying too implicitly upon the wondrously bountiful gifts which nature has conferred upon his country.

Trade and Commerce.—International communication in Brazil is as yet in an imperfect state. The rivers offer a fine field for traffic enterprise, and steam transit has been introduced on some of them. Railway communication is also being introduced into the country, four or five important lines having already been opened. In constructing these railways great engineering difficulties have been successfully overcome. On the San Paulo Railway a mountain ridge of 2600 feet, the Serra do Mar, has been crossed by means of four inclines, thus opening up a communication with the level country in the interior, and presenting a rapid and cheap mode of exit to one of the most fertile coffee-growing districts of the province.

The foreign commerce of Brazil is very large. Vessels of all nations are admitted on the same conditions, and their cargoes pay the same duties. The chief ports visited by European vessels are San Pedro, Santos, Rio Janeiro, Bahia, Pernambuco, Maranhao, Para, Aracati, Ceara, and Parahyba. Rio Janeiro is the chief place of export for coffee, Bahia for sugar, and Pernambuco for cotton.

The commercial intercourse of Brazil with the United Kingdom in recent years is shown in the subjoined table:—

Years.	Imports into the United Kingdom.	Exports to Brazil.
	£	£
1882	6,479,268	6,875,687
1883	6,160,339	6,618,470
1884	4,766,995	6,175,116

The two great staple articles of Brazilian imports into the United Kingdom are raw cotton and unrefined sugar. Coffee and hides are also imported in large quantities. By far the most important article of British exports to Brazil is manufactured cotton, the yearly average value of which is above £3,500,000. Linens, woollens, and iron manufactures are also exported in large quantities.

The imports into Brazil from all countries amount to about £17,000,000, and the exports to £21,000,000 per annum, so that it will be seen that a large proportion of both the imports and exports are from and to Great Britain; but Brazil has also commercial intercourse with France, Holland, Belgium, Portugal, and the United States.

Revenue and Expenditure.—The revenue of the empire is derived from direct taxes, principally imposed on landed property, house rent, trades and occupations, and transfer of property; and from indirect taxes, consisting of duties on imports and exports. The revenue for 1884 was about £12,900,000, and the expenditure £15,460,000. There were large deficits during the years 1865-71, caused mainly

by the war against Paraguay, terminated in 1870, the cost of which, calculated at upwards of £50,000,000, was covered partly by increased taxation and partly by loans contracted at home and abroad. Old charges of the colonial times, the war of independence and with Uruguay, payments of indemnities to foreign nations, loans for public improvements, and loans to fill up deficits, all tended to build up a national debt, which in 1885 amounted to £31,000,000. The customs tariff is enormously high, and the heavy taxes thus levied prevent foreign capital from flowing in and taking advantage of the numerous railways and other costly public works. The country has thus been opened up long before there is anything in it to repay the cost of opening.

Money, Weights, and Measures. The milreis, of 1000 reis, is of the approximate value of 2s. The standard of value is the gold octava of four milreis; gold and silver coins, however, have almost disappeared, and the only circulating medium is an inconvertible paper currency.

The French metric system of weights and measures came into compulsory use in 1872.

Constitution and Government.—The government of Brazil is monarchical constitutional representative. The General Assembly is composed of two chambers—the Chamber of Deputies, elected for four years, and the Senate, to which the members are appointed for life. The number of senators at present is 58; that of deputies 122. The deputies are chosen by provincial electors, who are themselves elected by the people. The senators are chosen also by the provincial electors, in triple lists, from which three candidates the emperor selects one, who holds office for life. The deputies receive a salary of £270, and the senators £400, for each annual session of the legislative assembly, which usually extends over four months.

To each province of the empire there is a legislative assembly, chosen by the electors. The provinces are governed by presidents appointed by the emperor.

Army and Navy.—The army is formed partly by enlistment and partly by conscription. In extreme cases impressment is resorted to; a liberal bounty, and a grant of land at the end of fourteen years' service, procures about one-third of the necessary number of soldiers. The Military Forces Bill for the year 1884 fixed the minimum of the land forces at 32,000 men in time of war, and 20,000 in time of peace; and that of the naval force at 8000 in time of war, and 1000 in time of peace. There is also a national guard, which municipal returns describe as 603,931 men strong. The active naval force in commission in 1884 comprised eight sailing vessels, thirty-nine steam gunboats, and twenty-one ironclads. The ironclads are comparatively small. There are also some torpedo boats.

History.—Brazil was discovered on the 3rd of May, 1500. Pedro Alvares de Cabral, who, after the return of Vasco da Gama, was sent by the King of Portugal with a large navy to the East Indies, directed his course from the Cape Verde Islands to the south-west, and was carried by the equatorial current so far to the westward that he found himself very unexpectedly in sight of land in 10° S. lat. This country was Brazil. He sailed along the coast as far as Porto Seguro (16° S. lat.), where he landed and took possession. He sent an account of his discovery to Lisbon, and continued his voyage to India. The King afterwards sent Amerigo Vesputi, a Florentine, to examine the country, who took a rapid survey of nearly the whole of its shores, and upon his return published an account of it, with a map.

As the country was valued at first only for its forests of dye-wood, the kings of Portugal did not show much solicitude about it. Between the years 1531 and 1545, however, many districts were colonized by Portuguese noblemen, to whom grants of land were made. In 1549 a governor of Brazil was sent out; and in 1567 the town of Rio

Janeiro was established. During the remainder of the sixteenth century and the first half of the seventeenth, Brazil was exposed to the attacks first of the English, then of the French, and still more extensively and successfully of the Dutch; but by the year 1660 Portugal regained peaceful possession of the whole. It was not till the end of that century that the Portuguese discovered the existence of gold, and in 1728 of diamonds, in Brazil. After these discoveries the home government looked naturally with more solicitude to Brazil.

As soon as the United States of North America had obtained their independence a wish for some similar change sprang up in Brazil, and events in Europe took such a turn that she obtained her object almost without bloodshed. When Napoleon I. declared war against Portugal the royal family left Europe for Brazil, where they arrived on 22nd January, 1808. Considering Brazil as the principal part of his remaining dominions, King John VI. began to improve its condition by placing the administration on a more regular footing, and throwing open its ports to all nations. On the fall of Napoleon I. the king raised Brazil to the rank of a kingdom, and assumed the title of King of Portugal, Algarve, and Brazil. In 1821 public feeling took such a turn that the king thought it prudent to proclaim a constitution for Brazil. The Portuguese Cortes wished to treat the Brazilians merely as colonists, whereas the latter sought by every means to become independent of the mother country; and, after various struggles between the contending parties, Brazil declared itself an independent state on the 12th of October, 1822, and chose Don Pedro, son of the King of Portugal, as emperor.

A slight but fruitless attempt was made by Portugal to resist this assumption of power on the part of Brazil, and obliged it to declare its independence. In 1826 King John VI. of Portugal died; and as Don Pedro then became heir to the Portuguese throne, he resigned Portugal to his daughter Donna Maria, retaining the empire of Brazil to himself. In April, 1831, a series of disputes between the emperor and the deputies rose to so serious a height that Don Pedro resigned in favor of his only son, the present Emperor Pedro II., then only an infant.

BRAZIL' NUTS grow upon a remarkable tree, *Bertholletia excelsa*, belonging to the order MYRACETACEÆ. It is of large dimensions, and forms vast forests on the banks of the Olinico. Its stem averages 100 feet in height and 2 feet in diameter, not branching till near the top, whence its boughs hang down in a graceful manner. The fruit is a spherical case as big as a man's head, with four cells, in each of which are six or eight nuts; its shell is rugged and furrowed, and covered with a kind of a green colour. There are no lids to these fruits, as in the genus *Lecythis* (monkey pots); and as the nuts cannot therefore fall out they are more easily collected. The nuts are irregularly triangular bodies, having a hard shell, which is very much wrinkled, and is fixed to a central placenta by the lower end. The seed is a firm, oily, pure white almond.

BRAZIL' PINE. See ARAUCARIA.

BRAZIL' WOOD is obtained from *Casalpinia Crista* a tree which grows in the West Indies, and also from *Casalpinia cchinota*, a native of Brazil. The trees are large, crooked, and knotty; the leaves are of a beautiful red, and exhale an agreeable odour. Notwithstanding the apparent bulk, the bark is so thick that a tree as large as a man's body with the bark will not be so thick as the leg when peeled. When cut into chips it loses the pale colour it had before, and becomes red, and when chewed has a sweet taste. It is used for various purposes by cabinet-makers, and admits of a beautiful varnish, but its principal use is in dyeing red; and though the colour is liable to decay, yet by mixing it with alum and tartar it is easily made permanent. There is also made of it, by means of acids, a sort of liquid cake or enamel for painting in

miniature. Lima wood contains as much colouring matter as Pernambuco wood, viz. about 2·7 per cent.; Sappan wood (from the East Indies), only about 1·5 per cent.; and Nicaragua wood still less, though it is preferred for some purposes. "Brazilletto" is a common name for all trees belonging to the genus *CASALPINIA*, but it is applied more particularly to *Casalpinia brasiliensis*, the wood of which is used for cabinet work, but is of inferior quality. It is used for violin bows, the celebrated Tourte having found that it combined the requisite weight, strength, and elasticity in a far more perfect way than any other wood.

BRAZILEIN, the red colouring matter of Brazil wood ($C_{18}H_{14}O_8$). This colouring principle is obtained by oxidation from Brazilin ($C_{18}H_{14}O_8$), a colourless crystalline substance, the solution of which, on exposure to the air, becomes a brilliant red, and deposits crystalline needles of brazilein. The principle can be extracted from the Brazil wood by water; it is soluble also in alcohol, ether, and ammonia. The solution is coloured purple by alkalis; it forms purple precipitates with lead and tin salts, and red with alum. It is very extensively used in dyeing and calico printing.

BRA'ZING is the fastening together of two pieces of metal (as iron, copper, brass, &c.) with hard solder, which is an alloy of brass and zinc, more fusible than the metals to be united, but expanding on heating in about the same degree; tin or silver is sometimes added to increase the fusibility. The solder is used finely powdered, and when mixed with ground borax and water is applied while damp to the pieces to be united, which must be perfectly clean; when dry they are heated till the solder melts and runs between them. This may be accomplished in a blowpipe flame if the pieces are small, or if large in a bright fire.

BRAZZA, an Austrian island off the coast of Dalmatia, in the Adriatic. It yields oil, figs, almonds, saffron, and wine, and is noted for its cheese (made from kids' milk) and its honey. There is, however, little corn produced. The surface of the country is mountainous and rugged. Its area is 170 square miles, and the population about 16,000. Brazza is the ancient *Brattia*.

BREACH, an opening formed by the partial demolition of a rampart in order to permit an assault to be made upon the defenders in the interior of a fortified place or work.

BREACH, in law, signifies the breaking of an engagement or the violation of a right, and it has a number of special applications, among which are the following:—

Breach of Arrestment, the name given in Scotch law to the contempt of court committed by an arrestee, who pays the sum or delivers the goods arrested in defiance of the order given. Such act renders him liable in damages to the extent of the funds paid away and costs.

Breach of Close, in English law, means the unwarrantable entry upon another man's property, and renders the trespasser liable to an action for damages. When cattle commit a breach of close the owner is liable for the damage caused, and the law gives the party injured a double remedy in this case by permitting him to detain the cattle thus doing damage until their owner has made satisfaction, or to bring an action at law for the damage done. In some cases a forcible entry on another man's land or house is justifiable, and does not amount to breach of close or trespass; as when a man goes to demand or pay money therepayable, or to execute in legal manner the process of law. A man may also justly entering an inn without invitation, as by the custom of the realm an innkeeper is bound to receive a guest at any hour of the day or night, provided the guest offers himself in a proper condition to be received, is ready to pay for his accommodation, and there be room to accommodate him. But a guest who misconducts himself, and refuses to leave at the proper time, or who insists on staying all night when there is no room to accommodate him, and against the will of the innkeeper, becomes

guilty of a breach of close, and is rendered liable to action for damage.

Breach of Covenant implies the violation of a covenant of agreement, by which the maker of the covenant and his representatives become liable to an action.

Breach of Contract may be taken as including any violation of a legal engagement for which at law damages may be recovered, or against which the injured party may seek the aid of the law in order to compel the breaker to perform the duties undertaken.

Breach of Peace includes all offences against public tranquillity.

Breach of Pound.—In English law all cattle impounded are regarded as being in the custody of the law, and any person who shall illegally release them becomes liable to a penalty not exceeding £5 for each offence, or in default of payment committal to a house of correction.

Breach of Promise to Marry.—When two persons, male and female, mutually agree to marry one another, such an agreement is termed a contract of betrothment. It is not necessary that either shall have made a definite promise, in words or by writing, to make this conduct valid, if it can be shown that a general definite understanding existed between the parties interested and their friends, or the friends of one of them, that marriage should take place. If this contract be broken by either party without just and sufficient reason, either by contracting marriage with another person, refusing to fulfil the promise given, or failing to do so within a reasonable time, an action at law may be brought for the recovery of damages by the person injured. A minor who has received a promise of marriage from a person of full age may bring an action if the promise is broken, but a minor is not liable to an action. A promise of marriage that has been obtained by false representations is not binding, nor is it binding when one person discovers that important particulars concerning the life or circumstances of the other have been wilfully concealed in order to obtain such a promise.

BREAD AND BAKING. The term bread is applied to a variety of food preparations, all of which, however, agree in one general fact, which is, that they are the product of some form of dough, which is rendered fit for eating by being baked in an oven, or over or in front of a fire. Generally speaking, the dough is made from the flour or meal which results from the grinding or "braying" of one or other of the cereal grains—wheat, oats, rye, barley, maize, &c.; and the liquid which is used in bringing about the necessary cohesion of the flour or meal particles is water, although in the preparation of some domestic kinds of bread sweet-milk or butter-milk is used. Other kinds of meal are also employed in making bread, such, for example, as that obtained by grinding pease; and the resulting bread is that which used to be very common in Scotland under the name of pease-meal "seones" or "bannecks." In almost all cases salt is used in small quantities, in order to give a certain degree of palatableness to the baked dough. Flour (or meal), water, and salt may be said to be the materials generally used in making bread.

Most of the forms of bread spoken of or referred to in the foregoing remarks differ very materially from that kind of bread which forms the staple article of diet among all civilized communities, in respect of the fact that they are *unleavened*, by which we mean that no material is added to the flour or meal to impart lightness or sponginess to the bread. In contradistinction to those primitive kinds of bread, that of which we are about to speak more in detail is known as *leavened* bread, and is the product, as a general rule, of a kind of fermentation which is set up by yeast or barm, although the carbonic acid gas intended to raise the bread is sometimes produced by other means, and introduced into the dough by the use of aerated water, that is, water containing carbonic acid gas dissolved under pressure.

The flour or meal forming the basis of ordinary leavened bread is a very complex material. The quantities of the different ingredients vary with the kind of grain, but in a general way they may thus be indicated:—Water ranges from about 11 per cent. up to fully 14 per cent.; starch is present to the extent of from about 53 per cent. in barley up to 62·3 per cent. in the flour from old wheat, and even up to 78·8 per cent. in rice flour; the quantity of fatty or oily matter varies from about 0·1 up to 1·7 per cent., maize being the richest in that respect, and rice the poorest. Cellulose is least in rice (0·2 per cent.), and greatest in maize (14·9 per cent.); while wheat stands about midway in that respect, the amount of that constituent being about 8·3 per cent. (in old wheat). The two soluble bodies, gum and sugar (both ternary compounds), taken together, range from 1·6 per cent. in rice to 3·8 per cent. in wheat, up to 5·7 per cent. in oats, and 11·3 per cent. in rye. What are known as the albuminoids, or the flesh-forming ingredients of the cereal grains, amount to about 16 per cent. in oats, to about 11 per cent. in wheat, and down to 7·2 per cent. in rice. The mineral ingredients generally range from about 1 per cent. up to 2·8 per cent., wheat standing nearly midway as regards those compounds.

These various substances, or groups of substances, all perform distinct parts in the production of bread. In a general way, it may be remarked that the starch and the crude gluten (the latter of which is included in the "albuminoids") play the most important parts in the chemistry of bread-making. The former is the material which suffers the chemical change or degradation that is set up by the yeast-fermentation. It is specially acted upon by one of the albuminoid bodies known as "cerealase," which behaves somewhat like diastase in the production of malt, and a quantity of it is converted into dextrose or sugar, while some of it ultimately becomes transformed into carbonic acid and alcohol. If a little wheat flour be made into dough with water, and the same dough be washed under a stream of water for some time, all the starch may be easily removed, and the mass which remains is very sticky and adhesive. It is the "crude gluten" just referred to, and is characterized by possessing a peculiar kind of tenacity and elasticity; in fact, it is the material which contributes so largely to produce a viscid structure in the dough, and eventually in the bread made from wheat flour. Being exceedingly elastic, the gluten entangles the carbonic acid gas as it is generated by the action of the yeast on the starch; and being thus entangled, the carbonic acid gas raises the whole mass of the dough. In no case is the flour of any other of the cereal grains so rich in the tough, elastic material under consideration as that produced from wheat, and consequently that kind of grain is pre-eminently fitted for making bread by the fermentation process, when it is desired that the bread shall be spongy, light, and thoroughly aerated.

The manufacture of loaf bread has, in recent years, attained to an extraordinary degree of perfection in Glasgow, owing to a variety of causes which it is scarcely necessary to enumerate. Such remarkable progress has been made within the past ten years or so in the factory system of producing bread that it is probable the number of baking firms has been reduced 50 per cent. in that period, notwithstanding the fact of the population having greatly increased in the same time; and it has lately been stated on excellent authority, that the weekly capacity of twelve of the largest bakeries in Glasgow in the year 1882 was 8700 sacks of flour of 280 lbs., as against 3950 sacks of flour consumed in twelve of the largest bakeries in London. Two of the largest of the Glasgow bread factories are those owned by Messrs. J. & B. Stevenson, and by Messrs. Bilsland Brothers. Messrs. Bilsland's bakery in Hydepark Street is said to be the largest establishment of the kind under one roof that has yet been erected. Having

been favoured with plans of the Hydepark Bakery (through the courtesy of the architects, Messrs. Bruce & Hay), and of some of the machinery employed by the firm, it may not be out of place to illustrate in a brief way the most advanced factory practice in Glasgow by reference to that of the firm just named.

There are two bakehouses—one on the ground-floor of the main building, and the other directly above. In connection with each bakehouse, and leading from it, there are two barn-rooms, in which the manufacture of the barn or yeast is conducted. The bakery is worked in four divisions, each of which includes a barn-room, and for each of them there is a skilled and experienced foreman, whose responsibilities include the manufacture of the barn, the "setting of the sponge," the preparation of the dough, the management of his own portion of the bakehouse, and indeed everything pertaining to the production of the bread until it is delivered into the bread-packing department; and he generally has under his charge from twenty-five to thirty workmen. From these remarks it will be seen that neither French nor German yeast, nor that made by the home brewers, is employed at the Hydepark Bakery. As a rule, each foreman consumes in the manufacture of his own barn about 160 lbs. of malt per week, the yeast being made direct from that material in conjunction with a little flour and the necessary quantity of water. In the course of from three to four days the manufacture is completed, barn of that age being quite ready for making bread, and if carefully kept and treated may be used until it is seven days old. About 4 gallons of the finest yeast are sufficient to produce seventy-two dozen, or 864 2-lb. loaves.

The baker's duties, properly so called, begin with the "setting of the sponge," an operation which is done overnight, and whose success depends on great skill and experience. In the Glasgow baking factories the rule is to work on the "quarter sponge" system, by which is meant that about one-fourth of the flour required for a "batch" of loaves is used in making the sponge for the same. Say that a batch of thirty-six dozen 2-lb. loaves is to be made, then the sponge will be produced by the admixture of 2 gallons of yeast and 4 gallons of water (ranging generally from about 80° to 100° Fahr., according to the season) with 112 lbs. of flour and 1 lb. of salt. That mixture remains in the bakehouse, where it is kept sufficiently warm, for a period of from twelve to sixteen hours. During that time an extraordinary change takes place, which is partly chemical and partly mechanical. The gluten of the flour, in presence of the yeast ferment, causes the transformation of a portion of the insoluble starch into glucose or grape-sugar, which is soluble, and a part of that compound is eventually converted into carbonic acid and alcohol, and, as a consequence, the fermentation which is thus set up brings about a peculiar spongy condition in the whole mass.

Next in order another portion of the flour and salt is thoroughly incorporated with the quarter sponge by means of the mixing machine, one form of which is shown in Plate BREAD, fig. 1. This machine, whose essential feature is a vertical spindle, *D*, armed in its lower part with a number of blades, *E*, *F*, &c., is driven by a belt from the main line of shafting at a speed of 140 revolutions per minute. Resting on the floor of the bakehouse, there is at *F* a wooden tub, in the bottom of which is fixed a cast-iron footstep to receive the end of the spindle, which can be lowered into the tub or raised from it at pleasure. The thorough admixture of the materials forming the sponge is effected in about seven minutes. After standing for an hour and a half or so, the sponge is ready to be transformed into dough in the doughing machine. There are several kinds of doughing machines in use, but that which has been adopted by Messrs. Bilsland is the "Three-knife Doughing Machine" of Messrs. Drysdale & Pirie, Glasgow. As seen represented in the two end views (figs. 2 and 3), the machine is essentially a trough,

the lower half of which is formed of three hollows, while the upper half has vertical sides, which are 3 feet 4 inches apart, and the extreme length of the trough is 6 feet. The whole of this trough or box is formed of iron plates, and is supported on an iron framework which rests on the bakehouse floor. As the essential feature of the machine, there are three eccentric knives extending the whole length of the trough, which are shown at *E*, *F*, &c., fig. 4. At *A* there are shown the driving pulleys on the shaft, *N*, and on that also there are two pinions which are geared into larger spur wheels, *C*, keyed on the centre pinions, *D*, *D*, which again give motion to the eccentric knives just spoken of. These in their turn revolve, and in doing so they mix the dough most thoroughly. When the trough has to be emptied it is turned over by means of a worm and quadrant, whose position is simply indicated at *G* in fig. 2; and on the machine being set going again the knives pitch the dough into a harrow or bogie, which is placed underneath ready to receive it. The pulleys, *A*, *A*, run at a speed of about eighty revolutions per minute, while the knives make about fifteen or sixteen per minute.

After standing for about an hour and a half in the tub, where it is thoroughly mixed, as already indicated, the sponge is transferred to the doughing machine just described. The requisite quantity of salt is first mixed with it, and then a few pints of tepid water are added. In about five minutes these materials have been well incorporated with the sponge, and then the remainder of the flour necessary to form a batch is introduced into the machine. From the moment when the motion is recommenced until the completion of the doughing proper is reached, the time required is only about fifteen minutes.

Carefully covered, the dough in the dough-box or shallow bogie waggon is removed to a suitable part of the bakehouse, where it is allowed to remain at rest for an hour or so, when it is usually ready for cutting and moulding. It is expeditiously cut up into large masses, which are thrown upon the moulding tables that run along the centre of each bakehouse. On each side of a moulding table there are frequently as many as a dozen men, by four or five of whom it is "sealed" or weighed out with great expertness in masses of about 2 lbs. 3 oz., which are skillfully rolled and moulded into shape by the hands of the other workmen, the shape of the mass varying with the kind of loaf wanted. The properly-shapen masses of dough are placed on wooden trays (or in sheet iron "tins," if "pan" bread is wanted), and allowed to remain for a short while at a gentle heat for the "filling" stage, and when the "filling" or "proof" is most completely effected, the trays of moulded loaves are rapidly brought forward to the oven mouth, the "hand-on" deftly lifting the loaves in pairs and handing them forward to the "runner," who, in his turn, expeditiously runs them into position in the oven with his "peel." In a period of from fifteen to twenty minutes a skillful runner can charge an oven with a batch of thirty-two dozen loaves; and if the ovens be double, as some of those in Hydepark Bakery are, two expert workmen will charge in seventy dozen loaves in the same space of time. The baking temperature required is from about 400° to 450° Fahr. Of course, owing to the nature of the dough, the temperature of the loaf never rises much above the temperature of boiling water. In about an hour and a half the baking operation is completed, and at the expiry of that time the bread is rapidly withdrawn from the oven, and carried on trays to the bread-packing department.

In respect of ovens, the baker's art has undergone no very essential change during the last 2000 years, as the oven that is still in most general use is practically the same as that discovered in the excavations of Pompeii. The most radical change that has been made in recent years is that involved in the patent of A. M. Perkins, the heating of the baking chambers in that case being obtained by

means of hot water circulating through malleable iron tubes, whereas the usual method of heating an oven is by the combustion of wood or coke. The temperature obtained in the Perkins system is about 450° Fahr., and the internal pressure on the tubes is from 2500 to 3500 lbs. per square inch. Mr. W. H. Nevill, an eminent London baker, was the first to adopt that system. He has now three large bakeries, in which there are collectively sixty-four such ovens, and in his hands they have proved very successful; they have not, however, been generally adopted. As regards ovens, another departure from general practice is a revolving oven, an American invention, known as a "reel oven;" but it can only be used for pan loaves. The rotary portion of this oven is something like a steamship paddle-wheel, but having trays, twelve in number, suspended from the periphery. Including the trays, the rotating structure is 15 feet in diameter, and its productive capacity is said to be equal to that of three ordinary hand ovens.

Hitherto our remarks have dealt only with the manufacture of leavened bread, but we ought also to refer, however briefly, to the production of ship bread, which is of the unleavened kind. Ship biscuits are made in a very simple way, the dough being produced by mixing the flour and water (as little of the latter as possible) in a mixing or doughing machine, and then working the crumbly dough between heavy iron rollers into a continuous sheet for the stamping operation. The cut discs of dough are next transferred by hand to the trays of a mechanical revolving oven, sometimes called a plate oven. These ovens, which are made in large numbers by Messrs. T. & T. Vickers, Liverpool, measure from 32 feet long by 6 feet wide up to 40 feet long by 8 feet, and are capable of baking from 15 cwt. to 75 cwt. per day of twelve hours. Ship bread is also baked in Glasgow by means of the American reel ovens, three of which have been fitted up in the extensive establishment of Mr. Andrew Reid, who first introduced them into this country.

BREAD, ARMY. This is now prepared in camps and barracks by bakers of the supply sub-department of control organization. In former times it was supplied by contract, and the quality was generally very bad, but at the present day great care is exercised over its preparation, and an excellent article is usually turned out by the army bakers.

BREAD-FRUIT (*Artocarpus*) is the genus which has given its name to the order *ARTOCARPACEÆ*. It consists of trees having stems of very considerable size, with large leaves, which are exceedingly rough with little points. Many species are known, some of which, as *Artocarpus chaptalia* and *Artocarpus hirsuta*, are large trees, and yield valuable timber in the forests of Bengal and Malabar. The only two we shall notice are the Bread-fruit and the Jack.

The Bread-fruit (*Artocarpus incisa*) is a native of the South Sea Islands and of many parts of the Indian Archipelago; it inhabits only such places as are both hot and damp; the winters of Bengal are too cold for it. It forms a moderate-sized tree, rarely exceeding 40 feet in height, with leaves deeply divided into sharp lobes, and sometimes as much as 3 feet long. The fruit is green and of considerable size, equalling a melon of the larger kind in dimensions, and is of many different forms. One variety produces it free from all spines on the surface or from seeds internally; this is the best sort. Others are split into deep lobes, or covered all over with the sharp-pointed fleshy tops of the calyxes. Captain Bligh was sent to introduce the bread-fruit into the Antilles. The well-known mutiny of the sailors prevented the attempt, but a second mission in 1798 was successful. It is now cultivated in several parts of equatorial America.

The Jack (*Artocarpus integrifolia*) is cultivated in the islands of the Indian Archipelago and Southern Asia from the Punjab to China. It is in its general appearance like

the bread-fruit, but its leaves are totally destitute of all laceration; and its fruit, which is very prickly, weighs 60 or 70 lbs. This latter is yellow, and constitutes the principal part of the diet of the natives in some parts of India; but it has an offensive odour, and is little esteemed by Europeans; all, however, concur in attesting the excellence of the nuts when roasted. A. de Candolle considers its native country to be India, at the foot of the Western Mountains.

BREAD-NUT TREE is a native of Jamaica and Mexico. It has a tall trunk, and very small flowers collected into globular heads. The leaves are from 3 to 5 inches long, and are without hairs. The fruit is a berry about an inch in diameter, containing a single seed, the so called bread-nut. The seeds are very wholesome, and taste like hazel nuts. Cattle are fed on the young shoots, and the wood is used in cabinetmaking. The botanical name of the tree is *Brosimum alicastrum*. See *BROSIMUM*.

BREAKWATER, an artificial mound of stone, &c., constructed to defend the entrance of harbours and roadsteads from the violence of the sea waves. The most remarkable is the breakwater at Cherbourg, 12,356 feet in length; the width of the base is 298 feet, crowned by a platform 21 feet in width, beyond which there is a solid granite parapet 8 feet wide and 5 feet high towards the sea, and rising 12 feet above the highest spring tides. The work was commenced in 1783 by Decaen, and finished in 1853, the estimated cost being £2,682,191. This vast structure shelters nearly 1926 acres of water space.

Plymouth breakwater is 5100 feet in length, and the height of the crown only 2 feet above spring tides. It consists of an insulated mole (see *PLATE*) or vast heap of stones and stonework, stretching across the Plymouth Sound, and opposing a barrier to the heavy rolling swell of the Atlantic. It was begun on the 12th of August, 1812, and took nearly forty years to accomplish. The cost of its formation was upwards of £1,500,000 sterling. The straight portion of this vast mass of stonework is about 1000 yards in length, and the two wings 356 yards each, making up the total length to about a mile. The width of the line of stonework at the bed of the sea varies from 300 to 400 feet, but slopes so rapidly upwards that the breadth at high-water mark is only 50 feet. The top is a flat horizontal surface, elevated a small distance above the surface of the water. The total depth varies from 10 to 80 feet.

The breakwater of Portland is about 2 miles in length, and has become of great value by converting the large expanse of water between the Dorsetshire coast and the island, or rather peninsula, of Portland into a harbour of refuge. See *PORTLAND*.

The breakwater at Holyhead, designed to convert the roadstead or bay into a harbour of refuge, was commenced about 1847, and was formally declared complete by the Prince of Wales in 1873, thus having taken about twenty-six years to build. It consists of a rubble mound 400 feet broad at the base, and 7860 feet long. One end is attached to the shore, and on the inner side of the mound a massive masonry wall is built, fitted with a parapet, and having a railway on the top. It contains about 7,000,000 tons of stone, and cost nearly £1,300,000.

The cost of solid breakwaters, both in construction and for repairing, is enormous. It costs £15,000 a year to keep the one at Plymouth in repair. It is often practically impossible to construct them where most urgently required; and when constructed they in many instances cause such a deposition of silt as to render them in a few years comparatively useless. To obviate these objections it has been proposed to construct floating breakwaters, composed of rows of iron cylinders, or of wrought-iron lattice framework, in passing through which the waves would be gradually and successively disintegrated and strained, as it were, of all their violence, until they reached the landward side of the barrier in a state of complete quiescence. Such break-

waters could be constructed at about one tenth of the usual cost of solid structures. The theory is based upon the now well ascertained fact that at the depth of about 15 feet below the surface the influence of waves practically ceases, and there is therefore no need of a breakwater ever exceeding this depth from the surface. The subject was thoroughly elucidated in a paper read by Mr. Cargill in 1871 before the Society of Engineers. It would appear that the first idea of floating breakwaters was taken from an observation of the effect produced upon waves by the presence of some natural obstacle in the sea, such as reeds and seaweed. The gulf-weed is a well-known instance. It has been found that, although its depth does not exceed 2 feet, yet even in strong gales there is perfectly calm water to leeward of it. These propositions have the merit of ingenuity, but up to the present they have not been tested in actual practice.

BREAM is a name applied to two different genera of fishes, the one belonging to the order *Physostomi*, the other to the order *Acanthopterygii*. The latter genus, *Pageius*, is a member of the family *Sparidae*, and is better known under the name *SEA BREAM*, under which heading it will be noticed. The name *bream* is here restricted to the genus *Abramis*, which is closely allied to the *CARR, BARBL, &c.* and other members of the family *Cyprinidae*. The chief distinguishing characters of this genus consist in the deep and compressed form of the body, the want of barbels to the mouth, the short dorsal fins, which are placed behind the ventrals, and the long anal fin. The Common Bream or Carp Bream (*Abramis brama*) is tolerably abundant in the lakes and slow running rivers of most parts of Europe, and is common in Britain. It is very prolific. The weight of this fish is commonly about 2 lbs., but specimens have been caught weighing from 8 to 12 lbs. The White Bream or Breamlet (*Abramis bicca*), the only other British species, occurs in the Cam in Cambridgeshire, and other rivers in different parts of England.

BREAMING. When a ship has laid for a long while in harbour, or has made a long voyage, it is generally found that her sides and bottom have become coated with shell-fish, barnacles, grass, weeds, &c., &c., which retard her speed and require removal. One method consists in laying the ship around and applying fire to the bottom, whereby the coating of pitch, sulphur, and tallow, &c., is melted, and together with the adhering growths and filth can be scraped and rubbed off. This process is termed *breaming*, and a vessel when laid upon her side for this purpose is said to be *breamed*.

BREAST-PLATE. See *ARMOUR*.

BREAST-WORK is a mass of earth raised above the natural ground for the purpose of protecting troops against the fire of an enemy, its height being only such as will permit the protected party to fire over it when mounted on a parapet or step. When the work has its surfaces carefully finished, particularly when it is elevated on the ramp of a battery, or constitutes a considerable field fort, it is designated a *parapet*; the word *breast-work* being chiefly applied to a rudely-formed mass of earth thrown up to cover troops on a field of battle, or doing duty as an entrenchment, or to the gabions which the sappers place and fill with earth for the protection of the troops in the trenches. The entrenchments with which the Greeks and Romans protected the ground occupied by their armies were breast-works.

BREATH, OFFENSIVE. As a general rule the breath, in health, should be perfectly sweet and tasteless, and foul breath generally indicates some disorder, either local in the mouth or nose, or arising from the internal organs. There are some individuals who seem to have naturally disagreeable breath, but who otherwise enjoy good health, and in females it may sometimes be noticed at certain periods as a temporary inconvenience which passes

off in time of itself. Many diseases impart a characteristic odour to the breath, the presence of which is a valuable guide to the physician in his diagnosis; and in certain diseases, notably in most forms of fever, the breath is not only offensive but infectious. In a very large number of cases, however, offensive breath arises as a result of indigestion or want of attention to the cleanliness of the teeth. It is a frequent accompaniment of habitual constipation or of a disordered state of the stomach, and in such cases its treatment must consist of the alleviation of the conditions by which it is caused. Attention must be paid to the state of the intestinal canal, which should be kept freely open, tonic medicines being also used to impart strength. Soda is also useful in correcting acidity, and charcoal sometimes proves to be of great value. The latter may be used in the form of biscuits or powder, or in combination with other remedies, as in the following prescription:—Carbonate of bi-muth, 10 grains; wood charcoal, 10 grains; bicarbonate of soda, 5 grains—to be taken half an hour before meals for a week or ten days.

When foulness of breath is caused by decaying teeth the assistance of the dentist must be sought, in order that they may be stopped or removed; and where the teeth are sound but have been neglected, they must be carefully and habitually cleansed. They should be washed by means of a soft brush and a little tepid water, morning and evening at least, the latter being the more important of the two periods. A wash composed of a teaspoonful of tincture of myrrh to a pint of water, or the addition of a few drops of Condy's fluid to the water used each time the teeth are brushed, will also be found useful. Alcoholism, or the condition brought about by over-indulgence in alcohol, is usually marked by a peculiar and offensive smell of the breath, that is always present, and can be distinguished even from the odour given off by the latest indulgence in spirits, &c. Medical treatment has no power over this while the habit leading to it is persisted in, and in such cases total abstinence is the only cure.

BREATHING. See *RESPIRATION*.

BREATHING PORES. See *STOMATA*.

BRECCIA is a geological term applied to a fragmentary or *CLASTIC ROCK*, consisting of angular fragments cemented together. It is usually of subaerial origin. The varieties are named either after the principal or more important fragments which they contain, as quartz breccia, limestone breccia, bone or osseous breccia; or according to the cementing material—feruginous, silicious, or calcareous breccias. Volcanic breccias are composed of angular rock fragments that have been caught up in a molten lava, and friction breccias are found in faults and fissures by the disintegration of the sides; these latter are more properly *Fault Rock*.

BRECHIN, a royal burgh and market-town in the county of Forfar, Scotland, is situated on the South Esk, 8 miles W.N.W. from Montrose, and 504 from London by the North-western and Caledonian Railways. It has linen and sailcloth manufactories, and establishments for spinning, bleaching, distilling, and brewing, and there are extensive freestone quarries in the vicinity. The town stands on an abrupt declivity, and some of its streets are very steep; but it is well built. The town-house contains a guildhall on the second floor, and a court-room and prison below. There are several Presbyterian meeting-houses, a parish church, consisting of the west end of the cathedral, an Episcopalian chapel, in a hall belonging to which there is a valuable library, and several schools. The town was created an episcopal see by David I. in 1150. The eastern part of the cathedral was demolished at the time of the Reformation. Near the cathedral is a round tower, 85 feet high, well built of hewn stone. There is only one other such tower in Scotland—that of Abernethy. It is supposed they were built by the Picts, but for what purpose is unknown. That at Brechin is surmounted by a conical roof of gray

slate, and has no staircase either without or within. In the upper part of the town are the ruins of the chapel of Maison Dieu, an almshouse formerly connected with the cathedral. A prettily laid out public park, $8\frac{1}{2}$ acres in extent, was opened by the Earl of Dalhousie in 1867. Brechin Castle stands on the top of a precipice, and is separated from the town on the east and north by a deep ravine, while its southern base is washed by the South Esk, there formed into a fine sheet of water. It was formerly a strong fortress, and in 1303 withstood a siege of twenty days by the English under Edward I., and surrendered only when its brave commander, Sir Thomas Maule, was killed. The Culdees once had a convent here. Of the eminent men which this place has produced, Dr. John Gillies, author of a "History of Greece," a translation of the Politics of Aristotle, and royal historiographer for Scotland, and Maitland the topographer, deserve special mention. Population of the royal burgh, 5295. Brechin is a parliamentary burgh, contributory to the Montrose district; population, 9031. It has railway communication with Montrose, Forfar, Arbroath, Dundee, and Perth.

BRECKNOCKSHIRE, in South Wales, is bounded N. by Cardiganshire and Radnorshire, W. by Cardiganshire and Carmarthenshire, S. by Glamorganshire and Monmouthshire, and E. by Monmouthshire and Herefordshire. This county extends, in its most distant points, from N. to S. 53 miles, and from E. to W. about 46 miles. Its area is 460,158 acres. The population in 1881 was 57,746.

The surface of Brecknockshire is extremely irregular, the valleys deep, and the mountains the highest in South Wales. It is intersected on the N. and S. by two long ranges of mountains; that on the N. goes by the general name of Epynt; the other range, beginning with the Caermarthen Beacons, runs nearly parallel to the Epynt Hills, and inclining more towards the S., terminates in Monmouthshire. There are other minor chains. Several of the mountains exceed 2000 feet in height—Cader Arthur, or Arthur's Chair, reaching 2910 feet. The principal rivers are—the WYE; the Usk, which rises in the Caermarthenshire Fan, about 5 miles from Treacastle; the Honddu, which rises in Dumdhu, and falls into the Usk at Brecknock; the Irvon, which rises in Bryn-garw, in the N.W. boundary of the county, and falls into the Wye about a mile above Builth; the Elan, the Claerwen, the Taf, and the Tawe. There is a canal from Newport to Brecknock. Many good roads traverse the county, and numerous railways lead from the collieries to the various outlets. About 5 miles E.S.E. of Brecknock is situated Llyn-Safaddu, or Llangorse Pool, a sheet of water 2 miles long, and in some places one in breadth, and beneath which it is said that there is a submerged town, supposed by some to be the Roman station *Lorentium*.

The climate varies considerably, according to the elevation and exposure, the hilly districts being very cold, and in some seasons subject to heavy rains. The principal geological formations are Silurian rocks and the Old Red Sandstone. A few of the Monmouthshire strata of iron and coal extend into Brecknock, and a little copper has been met with. There are many mineral springs near Builth and Llanwryd.

The soil in the more favourable parts of the county yields good wheat, and abundance of apples for cider; in the cold and wet soils barley and oats are the chief grain crops. In the highlands are bred small black and brindled cattle, horses, ponies, and good hill sheep. In the lowlands the Herefordshire breed of cattle predominates, and is on the increase.

Brecknockshire is divided into six hundreds, exclusive of the borough of Brecknock. It contains seventy parishes. The county is wholly in the diocese of St. David's, and province of Canterbury. The county returns one member to Parliament.

Brecknockshire remained in the power of the Welsh

princes until 1092. In that year the lordship of Brecknock was granted by the king to Barnard Newmarch; and that he might obtain possession of his rights, and the better defend himself against the natives, whose hostility and resistance to his authority made it difficult for him to maintain his position in the country, he built the Castle of Brecknock as a stronghold for himself and his troops. In the year 1377 the castle fell into the hands of Henry IV. From that time to the reign of Henry VIII. Brecknock Castle commanded Brecknock town; and the townsmen suffered much from the continual changes in the possessors of the castle. At length in 1521 the lordship of Brecknock became permanently annexed to the English crown, and in 1534 Wales became formally united to England.

There are several cromlechs, traces of British stations, of Roman encampments, and remains of castles.

BRECKNOCK, **BRECON**, or **ABERHONDDU**, the chief town of Brecknockshire, called by the Welsh Aber Honddu ("the mouth of the Honddu"), is 18.2 miles W.N.W. by rail from London, is an open valley at the confluence of the rivers Usk and Honddu. It is a corporate town, and returned a member to Parliament until 1885.

The castle was built, A.D. 1094, by Barnard Newmarch, a relative of William the Conqueror, who wrested the county from the hands of the Welsh princes. It was considerably increased and improved by the last Humphrey de Bohun, earl of Hereford, high constable of England and governor of Brecknock. The town originated at the same time as the castle. It was surrounded by strong walls. These, with the castle, were destroyed in the last civil war by the inhabitants to prevent a siege, or being saddled with the expense of a garrison.

Parts of several towers of the castle are still standing, in the grounds of the Castle Hotel; that called Ely Tower is the principal fragment remaining. Merton, bishop of Ely, whilst confined here, conspired with his gilder, the Duke of Buckingham, for the dethronement of Richard III. Hence derives its name. Two priories, the one Benedictine and the other Dominican, were also founded by Barnard Newmarch in the reign of Henry I. The first is now the parish church of St. John's, called the Priory Church; the second, Christ Church, was converted into a college by Henry VIII.

There are three bridges over the Honddu, and one over the Usk. The town is well supplied with coal, and is connected with Newport Docks by the Brecknock and Aber-gavenny Canal, which has a total length of 35 miles. Flannels and coarse woollens are manufactured. The borough of Brecknock is governed by a council comprising a mayor, four aldermen, and twelve councillors. It contained 6623 inhabitants in 1881. The spring and summer assizes and courts of quarter sessions are held here. It is a polling place and place of election for the county; the seat of a county court; and also the head of an archdeaconry in the diocese of St. David's, including the deaneries of Builth, Llywell, and the first, second, and third parts of Brecon, constituting a collegiate chapter. A very handsome congregational college was opened in 1869. Mrs. Siddons, the celebrated actress, was born here in 1755. It is also the birthplace of Dr. Hugh Price, founder of Jesus College, Oxford.

BREDA, a fortified town of Holland, in the province of North Brabant, 24 miles W.S.W. of Bois-le-Duc, on the Meuse. It is of triangular form, has four gates, a fine quay, an arsenal, castle, cathedral, observatory, government house, three prisons, and several churches. There are beautiful walks on the ramparts. There is a considerable trade by water, and manufactures of carpets, hair-cloth, hats, linen, soap, and musical instruments. The defences are strong, and can be improved by flooding the surrounding country, which is marshy. Here, in 1667, was signed a treaty between England and Holland.

Breda has been the scene of several congresses, and it is noted for the association of nobles formed in 1566, known as the "Compromise of Breda," against the measures of Philip II. of Spain. The castle was rebuilt by William III. of England in 1696. Breda was taken from the Spaniards by Prince Maurice in 1590, by means of a stratagem suggested by the master of a boat who sometimes supplied the garrison with fuel. With singular address he contrived to introduce into the town, under a cargo of turf, seventy chosen soldiers, these, having attacked the garrison in the night, and secured the gates, their comrades came to their assistance, and gained possession of the town. It was retaken by the Spaniards; under the Marquis of Spinola, in 1625, but was finally ceded to Holland by the treaty of Westphalia in 1648. The population is 11,000.

BREECH-LOADER. See GUN.

BREECHES, the covering for the legs, is a term derived from the Saxon *brec*, plural of *brec*; breeches, or "breeks," is therefore a double plural. The Latin word *bracæ* represents the Celtic lower garment, and is of undoubtedly Celtic origin. The corresponding word *trousers* is from the French *trousers*, and ultimately, from the Latin *torquere*, "to twist," representing something twisted round the middle. It is most remarkable that "breeches," which represented a long garment reaching to the feet, as may be seen in all ancient representations of contests between Romans and barbarians, has come to mean the short garment known as "knee breeches," while "trousers," originally only the *traces* which Highlanders still wear in their national dress, has gained what was the original sense of "breeches." The two words have exactly changed places. It seems strange that the civilized Romans were a bare-legged people, and the barbarians were clothed; but the custom was so universal that it is not uncommon to find *gens togata* and *gens braccata* ("robed nation" and "trousered nation") as synonymous with "Roman" and "barbarian."

BREECHES BIBLE, sometimes called the *Geneva Bible*, a translation of the Bible into English which was executed at Geneva by several English ministers who had been compelled to flee from the persecutions instituted by Queen Mary. It was the first edition printed in Roman letter, and the first in which the divisions into verses were marked. Issued in 1557, and provided with explanatory notes of a Calvinistic character, this edition enjoyed considerable favour with the Puritans until it was supplanted by the Authorized Version of 1611. The term "Breeches Bible" is given from the rendering of Gen. iii. 7, "Then the eyes of them both were opened, and they knew that they were naked, and they sewed fig tree leaves together, and made themselves breeches."

BREEDING. By this term is understood not only the multiplication of domestic animals, but the improvement of their qualities, and the establishment of those qualities as characteristics of a given stock. It must be obvious that the breeder's first object is to settle the purpose for which an animal is to be reared—whether for slow heavy labour or for speed, for a supply of animal food or for milk, for wool or for early ripeness for the butcher. Here he must take into consideration his means, his land, its extent, and its produce. He will then select the most perfect animals of their kind from which to deduce his stock, rejecting those which are faulty in form or inferior in the desirable qualities. A fault in the parentage of a stock, on whichever side it may be, though for a few generations it may be latent, is sure to reappear. Hence the necessity of having recourse to judicious crossings from time to time, choosing the male perfect in those points in which the female is defective, and also perfect in those points in which she is perfect. After all, however, something of the *give and take* style is unavoidable, for complete perfection in any animal among our domestic stocks is not

to be expected. Here, then, the judgment of the breeder is called into requisition; and he will remember that his aim ought to be utility, without which he cannot expect profit. In crossing a stock animals of the same strain, but either not related or distantly related, should be chosen; and they should have fed upon similar pasturage, and in similar localities. Sometimes it is allowable to cross animals nearly allied in blood; that is, to breed in and in; but this plan, though useful in the establishment of a new and improved strain, should be used cautiously, since, if it confirms good qualities, it also confirms bad ones.

Crosses between animals differing in their qualities should be avoided, for the mixed breed will seldom exhibit, in their due degree of perfection, the qualities for which each parent is remarkable. Injudicious crosses between the fine-wooled merino sheep, with an unthrifty carcass, and sheep of inferior wool, but ripening early for the butcher, have resulted in failure. If we make the merino a quick-fattening animal, with a good carcass, it loses its value as a wool-bearer. By judicious crossing all our domestic animals have been greatly improved. It is thus that the Durham and Yorkshire short-horned cattle have arrived at their present perfection. The cows, while in milk, are excellent at the pail, and when dry fatten readily for the butcher, and yield meat of fine quality. It is thus that the strain of our hunting horses has been brought to perfection; yet a violent cross between a racer and a cart-mare, or a mare of no blood, would almost certainly prove a failure.

To sum up, let the animals you wish to breed from present the same qualities; let them be as well bred as possible, perfect in form and in good health; aim at correcting all faults and defects, and at the improvement of the valuable qualities in which the breeder finds profit. If possible breed two or more families of the same kind, keeping them distinct, and occasionally crossing the one with the other. In this manner an improved breed may be, by judicious selection, produced. The nearer you approach perfection the more difficult will be the selection, and the greater the danger of retrograding. For a complete discussion of the principles of the art of breeding consult "The Variations of Animals and Plants under Domestication," by Charles Darwin.

BREEZE-FLY. See GAD-FLY.

BRE'HON LAWS, the ancient laws of the Irish, so called from being expounded by judges, named in the Irish language *Breitheamhain*, or Brehons. *Feineachas*, however, and *Breithneimeadh*, words signifying respectively, according to the received explanation, ancient laws and sacred ordinations, are the terms commonly applied to the collection of these writings by the native writers.

Prior to the Anglo-Norman invasion Ireland was wholly governed by the Brehon law; and notwithstanding the statements of Spenser, Davies, Cox, and others, that this was an unwritten and barbarous code, there is abundant evidence to prove that some of the collections of the *Breithneimeadh* are of equal antiquity with the oldest manuscripts of Irish history, whether civil or ecclesiastical—an antiquity which carries us safely back to the earlier ages of the Christian era. The extant collections are numerous and authentic; but the labour of translating, methodizing, and illustrating them must be that of years. Great efforts were made, both in the reign of Henry VIII. and of Elizabeth, to supplant the Brehon law; the 3rd and 4th Mary, chapter v., is also directed against some of its effects; but it was not till the 3rd of James that the final extirpation of the old law was effected. The whole kingdom being then divided into counties, with their several sheriffs and circuits of assize, the Brehon law became a mere subject of inquiry to the antiquary, and as such, at the present day, possesses perhaps greater interest than any other branch of Irish or Celtic archaeology. But the original Brehon MSS. are written in a dialect so antiquated

as to baffle almost all Irish scholars, and the accuracy of some of the existing translations, meagre as they are, has been seriously called in question.

BREISGAU, an old district of Swabia, now almost entirely included in the south part of the duchy of Baden. It was long governed by its own counts, but afterwards united to the dominions of Austria, by whom the greater part was ceded to Baden in 1806. The remainder was incorporated with Württemberg and Switzerland. Freiburg was its chief town.

BREITENFELD, a village of Saxony, about 4 miles N. of Leipzig, remarkable for three important battles fought on a plain in its neighbourhood. The first two took place during the **THIRTY YEARS' WAR**. One was fought on the 7th September, 1631, by the Swedes and Saxons under Gustavus Adolphus, and the Imperialists under Tilly—the latter wishing to compel the Elector John George I. to enter into an alliance with the emperor. Tilly was wounded, and the Swedes were completely victorious. This victory may be said to have preserved the influence of Protestantism in Europe, and to have secured freedom for Germany. The other took place eleven years after, when the Swedes, who were besieging Leipzig, under Torstenson, were again victorious. The third battle, of which Breitenfeld was partly the scene, was the celebrated engagement historically known as the battle of Leipzig, fought between the French under Napoleon I., and the Austrians, Russians, and Prussians, on the 16th, 17th, and 18th of October, 1813. The French were defeated chiefly owing to seventeen Saxon battalions, their allies, turning upon them in the heat of the engagement.

BREMEN, a free town of the German empire, stands upon the Weser, about 50 miles from its mouth, and had a population of about 115,000 in 1883. The Altstadt, or old town of Bremen, which is on the right bank of the river, contains some handsome streets and dwellings; but in general the streets are narrow, and in consequence of the height of the houses, dark and gloomy. It has large suburbs, and forms with these by much the larger portion of the city. The Neustadt, or new town, which stands on the left bank of the Weser, is regularly built, and has broad straight streets. These two quarters are united by three bridges, including the Weser Bridge, which crosses the Island of Werder, that lies between them, and is covered with buildings. The quays extend along both sides of the river. The ramparts of the old town have been made into promenades. Among the public buildings is the cathedral, erected in 1160, on the site of a wooden church built by Charlemagne, and celebrated for its vault, lined with lead, to preserve the bodies placed in it as long as possible, the oldest mummy there having been preserved for 400 years. There are also numerous other churches. The old archiepiscopal palace, now the town-hall, is an imposing building in the Gothic style. The old town-hall, built in 1405, is famous for its Rathswinkel, or "council's wine cellar." Besides these there are the exchange, in which the chief merchants hold their sittings, the arsenal, the granaries, the museum, the city library, the observatory from which Olbers discovered the planets Pallas and Vesta, and the theatre. An extensive and handsome building, for the higher class public schools, was erected in 1871. Some new water works were also opened in that year by an English company.

Bremen owes its prosperity to the navigable river on which it stands. It is the entrepôt for imports of all the countries bordering on the Weser, and especially for Hanover, Oldenburg, and Hesse-Cassel. Large vessels go up the river only as far as Bremerlehe, 28 miles below Bremen; there they discharge their cargoes in a new harbour called Bremerhaven. Ships of 200 to 250 tons unload at Vegesack, 13 miles below Bremen; and vessels of 7 or 8 feet draught go quite up to the town. Cargoes brought to

Bremerhaven and Vegesack are forwarded to Bremen by lighters and boats. Bremen is a place of great resort for the warehousing and transit of foreign and German goods; it has several banks, discount offices, and insurance companies. The ships of Bremen are largely engaged of late years in carrying out German emigrants to America. The chief imports are cotton, cotton-yarn, tobacco, petroleum, sugar, rice, coffee, tea, dye-stuffs, and other colonial produce. The exports consist of these same items and linens, grain, cattle, oak-bark, salt meat, hides, seeds, rags, wool, woollen goods, wine, and cigars. The town has several sugar-refineries, about 100 distilleries, several tobacco manufactories, tanyards, soaperies, cordage and canvas factories, cotton-mills, bleach-works, &c.

The total value of the imports into Bremen is over £22,000,000 per annum, and of the exports £20,000,000. Although the port has always been, and still is, more especially the emporium of the trade of Germany with the United States, its commerce with Great Britain and British colonies is of very considerable importance, and exceeds in extent the similar trade of any other German port except Hamburg. Of the 3100 vessels which annually enter and clear from Bremen, rather more than a fifth are from and to the United Kingdom. The total value of the imports from Great Britain is about £3,000,000 per annum, and of the exports thereto rather over £1,000,000.

Bremen was long connected by direct lines with Hanover, Oldenburg, and Bremerhaven, but from 1871-76 some new lines were constructed, which brought it into much closer connection with the east, west, and south of Europe. A handsome wide street, with a new bridge over the Weser, which connects more closely the business quarters on either side of the river, was opened in 1874.

The annual revenue and expenditure of Bremen is each about £150,000 per annum. About half the expenditure is for the interest and reduction of the public debt, which amounts to £2,000,000. The whole of the debt, which bears interest at $3\frac{1}{2}$ or $4\frac{1}{2}$ per cent., was incurred for constructing railways, harbours, and other public works.

The population of the state in 1883 was 160,000, or nearly 50,000 more than the city proper. The state comprises an area of 63,100 English acres. The soil is chiefly a sandy one, only a small portion being pasture, or so-called "marsch" land. The climate is similar to that of the eastern counties of England, the winters being, however, colder at Bremen. The free city of Bremen is governed by a Senate of seventeen members, forming the executive, and the Burgereonvent, or Convent of Burgesses, of 150 members, invested with the power of legislation. Two burgomasters, the first elected for six years and a half, and the second for four years, direct the affairs of the Senate, through a ministry divided into eight departments, namely Foreign Affairs, Church and Education, Justice, Finance, Police, Medical and Sanitary Administration, Military Affairs, and Commerce and Shipping. All the ministers are senators.

Bremen first rose into notice about 788, when it became the seat of a bishop. The city prospered greatly under its ecclesiastical rulers, who promoted its union with the Hanseatic League, but in the fourteenth century the citizens contrived gradually to shake off the archiepiscopal yoke. They joined the Hanseatic League, but for a long time kept aloof from its proceedings. In 1285 they were formally excluded from it, and although admitted again in 1308 they were afterwards repeatedly expelled. In 1522 Bremen embraced the Reformation, and in 1547 gallantly repelled an attack by the Imperial army. In 1640 it was summoned to the Diet, and allowed a seat and vote on the Rhenish bench, in the college of imperial cities. In 1648, at the treaty of Westphalia, the archbishopric to which Bremen had given name was secularized in favour of Sweden, who held it till the year 1712, when it was taken

possession of by Denmark, by whom it was ceded to Hanover in 1731. Bremen acquired from the electors of Hanover a full recognition of its independence and other prerogatives, which had sometimes been disputed by the Swedes. In 1806 it was taken by the French; and from 1810 to 1813 it was the capital of the department of the mouths of the Weser, but recovered its independence after the battle of Leipzig in 1813, and was admitted to the Germanic Confederation as one of the Free Hanse Towns by the Congress of Vienna. In 1867 it became part of the North German Confederation, and is of course now included in the United German Empire.

The municipal wine-vault of Bremen is the most celebrated in all Germany. One section, called the Rose, contains the famous Rosenwein, which is now two centuries and a half old. Six large casks of Rhine wine, Johannisberg, and as many of Hecheimer, were placed there in 1624. In the adjacent parts of the same division of the cellar are twelve large casks bearing the names of the Apostles, and containing wines not less precious, but not so aged by a few years. The other parts of the cellar are occupied with wines of a subsequent growth. By degrees, as a few bottles of Rosenwein are drawn off, the casks are filled up with Apostle wine, and that with some sort still younger, and so on, in such a manner that the different casks are always kept very newly full. The Rosenwein and Apostle wines are never sold but to citizens of Bremen. The burgomasters alone have permission to draw a few bottles, and to send them as presents to sovereigns. A citizen of Bremen may, in case of serious illness, procure a bottle at 20 francs on his obtaining the certificate of his doctor and the consent of the municipal council. A poor inhabitant of Bremen may also obtain a bottle gratis, after having fulfilled certain formalities. A citizen can also demand a bottle when he receives any celebrated personage as a guest.

BREMER, FREDERIKA, an eminent Swedish novelist, was born 17th August, 1801, at Toräa, near Åbo, in Finland. At that time Finland formed part of the kingdom of Sweden, but on its cession to Russia her father sold his estates there and removed with his family to Stockholm, Frederika being at that period only three years old. In 1828 she published her "Sketches of Every-day Life," a work which attracted immediate attention; but it was not until the publication of "The H. Family" that her merit became fully recognized. Her after-works, consisting of the "President's Daughters," "Nina," "The Neighbours," "The Home," and "Strife and Peace," followed in rapid succession, all of which served to sustain and increase her reputation. In 1841 these works were translated into German and published at Leipzig, and they soon obtained a wide circulation throughout the whole of Germany. In 1842 "The Neighbours," translated by Mrs. Howitt, was published in English, and the enthusiastic reception it received from the British public led to the translation and publication of "The Diary," "The H. Family," "The President's Daughters," "Brothers and Sisters," "Life in Dalecarlia," and "The Midnight Sun." From England these works passed over to America, where from one end of the United States to the other they soon became household property. In the autumn of 1840 Miss Bremer paid a visit to America, where she remained two years, subsequently giving the results of her observations in "The Homes of the New World," a work that was published simultaneously in England, America, and Sweden in 1853. She afterwards published a romance entitled "Hertha," designed to show the injustice of the laws of Sweden which regulated the property of women. The later years of her life were devoted to benevolence and philanthropy, and her liberality and zeal proved of immense service at Stockholm during the ravages of cholera and famine, and at Copenhagen after the Danish war in Holstein. She died

31st December, 1865. Her writings are characterized by purity, clearness of judgment, great knowledge of human nature, a clear, eloquent style, and graphic powers of description. Most of them have been translated into English, but the only complete edition is that published in German (Leipzig, 1857-63). Her life, letters, and unpublished works, issued by her sister, were translated and published in London in 1868.

BREMERHAVEN, the out-port of Bremen, stands upon a small tract, bought from Hanover in 1827, at the entrance of the Geeste into the Weser, on the right bank of its estuary, near the sea, opposite Geestmünde, founded in 1847, as a rival to Bremerhaven, by the Hanoverian government. It admits vessels drawing 22 feet, the wet and dry dock accommodation is ample, and the place is rapidly advancing, useful institutions keeping pace with the progress of the town. The population in 1883 was 15,000.

BRENNER, THE, a mountain of the Rhaetic Alps, Tyrol, 20 miles S.E. of Innsbruck; height, 6788 feet. The Pass of the Brenner, one of the lowest in the Alps, is practicable for carriages, and has been used since the time of the Romans; height, 4608 feet. The road which crosses it leads from Trent to Innsbruck, and the railway from Munich to Venice surmounts the pass by twenty-three tunnels. Near the pass there is a fine fall on the Eisak and a small lake, and the village of Brenner is at the foot of the pass.

BRENNUS, the name, or more probably the appellative, of several of the princes of the Gauls, of whom the most celebrated is a chief of the tribe known as the Senones, who flourished about 389 B.C. On the invitation of Aruns, a citizen of Clusium, who had some private feud to avenge, he entered and ravaged Etruria at the head of his tribe, and laid siege to Clusium itself. The inhabitants sent to Rome imploring the aid of the Romans, who sent some envoys to remonstrate with the Gauls. When asked what business the Gauls had in Etruria, Brennus replied, "Might is right, and everything belongs to the brave." The Roman deputies subsequently took part in a skirmish under the walls of the city, and the Gauls in revenge marched 60,000 strong against Rome. An army of 40,000 men was hastily sent to meet them, and a battle was fought on the banks of the Allia, a little river about 12 miles from Rome, in which the Roman army was completely defeated. The conquerors gave themselves up to the delights of a drunken debauch in honour of the victory, and savagely mutilated the dead who had fallen in the conflict; but the delay caused by this enabled the Romans to send the women and children to Veii, and to remove their treasures, with stores of food and weapons, to the Capitol, where they resolved to stand a siege. The aged senators, who were too weak to aid in the defence and too proud to fly the city, dressed themselves in their robes of state, and sitting in their curule chairs awaited in silence the invasion of the enemy. When discovered, their majestic appearance and high courage for a time awed the barbarians, but they were ultimately slaughtered to a man, and the city was plundered and set on fire. The Gauls next endeavoured to storm the Capitol, but this was so fiercely defended that they were driven back with great slaughter. They afterwards attempted a night attack, and had almost succeeded in climbing up an unguarded part of the wall when the cackling of the geese that were kept in the temple of Juno gave the alarm, and the garrison turned out and repulsed them. The defenders held out for seven months, when they were compelled by famine to make terms, and to pay by way of ransom 1000 lbs. of gold. While this was being weighed the tribune Sulpicius complained that the weights used by the Gauls were not correct, on which Brennus threw his heavy sword in the scale, exclaiming in words that have become proverbial, "Væ Victis" ("the weakest must go to the wall"). On

their way homewards the victorious Gauls, according to Diodorus, were waylaid by the people of Cære and cut off to a man. Livy, however, states that Camillus, the dictator, refused to ratify the capitulation made with Brennus by the army of the Capitol, and, coming up as the gold was being weighed out, attacked the Gauls and destroyed nearly the whole of their army. These stories, however, are regarded by modern historians as being falsehoods invented by the Romans to conceal their defeat.

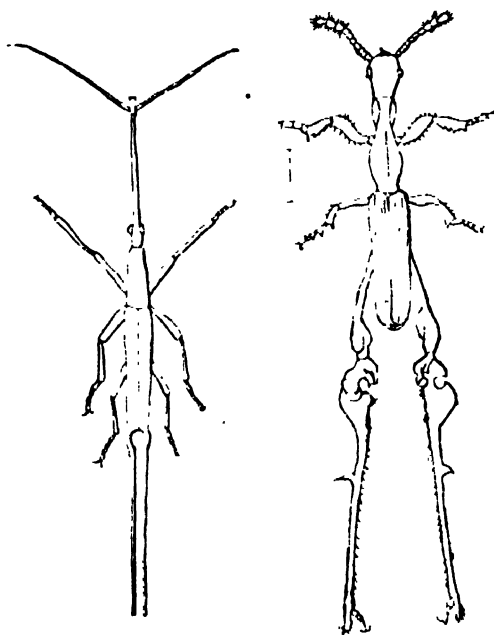
Another Gallic leader of the same name (or the same title) invaded Macedonia and Greece about 280 B.C., defeating and slaying Ptolemy Ceraunus, then king of Macedonia. He afterwards led a second expedition, made up of 150,000 foot and 60,000 horse, through Macedonia into Thessaly, where he was encountered by the Greeks at Thermopylae. Here the invaders, discovering a path over the mountains, came upon the rear of the Greeks, who were then taken off by their fleet. The Gauls marched thence to Delphi, in the hope of capturing the treasures deposited at the temple. The people of Delphi and the neighbourhood, 4000 strong, took up an advantageous position of defence, and their resolute resistance brought the invaders to a stand. The efforts for the defence were aided by a terrible storm of hailstones and by the shock of an earthquake, which struck terror into the hearts of the invaders, and impressed the defenders of the temple with the conviction that Apollo had come to their aid. The Gauls fled in confusion, fiercely pursued by the Greeks, and Brennus, in despair, drank himself to death.

BRENTA, a river of North Italy, rises from two small lakes near Pergine, in the Tyrol, a few miles E. of Trento, flows east through a long and narrow valley, and then turns south at Primolano, where it enters the Venetian territory. At Bassano the Brenta issues from the mountains into the great Paduan plain, through which it runs in a south-east direction, passing near Padua, whence it takes a course nearly due east, and falls into the lagoons of Venice, after a course of about 100 miles. At one time the Venetians, fearing that their lagoons might be choked by the sand brought by the floods of the Brenta, altered its course, and its ancient bed was afterwards made use of as a canal, which is now the chief means of water communication between Venice and Padua.

BRENTFORD, a market-town in the county of Middlesex, situated on the north bank of the Thames, where it is joined by the Brent, $10\frac{1}{2}$ miles from London by the South-western Railway. It consists chiefly of one long winding street, containing some good houses. The town-hall is a handsome building. The stand pipe of the Grand Junction Water-works at this town is 226 feet in height, inclosed in a campanile-like structure, and is a conspicuous object for many miles around. There are distilleries, soap manufactories, a brewery, sawing and planing mills, and considerable river traffic. Brentford, often called Braynford, is the county town for elections. Population of the town, 11,091. It was here that Edmund Ironsides defeated the Danes in 1016. The toll for the ancient bridge was granted in 1280 by Edward I. In the reign of Henry VI. a hospital of the Nine Orders of Angels was founded, and in 1445 a chapter of the order of the Garter was held at Brentford, in the Lion Inn, when the king created two knights. The Parliamentary forces were defeated by Prince Rupert in the streets, when Lilburne the Puritan was taken prisoner, and Ruthven, for his services in the action, was made Earl of Brentford, a title afterwards borne by Marshal Schomberg. Owing to its small size, combined with its being the county town of the great county of Middlesex, Brentford has often been used satirically for the capital of England. Thus Thackeray celebrates the virtues of George IV. as "king of Brentford." Cowper refers to the "two kings of Brentford on one throne;" and it is mentioned by many other writers, chiefly in an

uncomplimentary vein, as it has obtained an unenviable notoriety for mud. The well-known reference to the "two kings of Brentford" is supposed to have arisen from a remark in Buckingham's "Rehearsal," where Bayes prides himself on his plot, in which he supposes "two kings to be of the same place, as, for example, at Brentford." The population of Brentford in 1881 was 11,810.

BRENTIDÆ is a family of BEETLES belonging to the section TETRAMERA and the group RHYNCHOPHORA. The insects constituting this family are among the most remarkable of the beetle tribe, and are almost entirely confined to tropical climates. The body is very long and narrow, the head being prolonged into a rostrum or snout, which is very long and pointed in the females, and shorter, dilated at the end, and sometimes terminating in a strong pair of jaws in the males. The labrum or upper lip is absent. The female bores holes in the bark of dead trees with her snout, depositing her eggs in the holes. The grub bores



Diurus fureillatus.

Taphrodites melli.

into the wood, forms a chamber for itself, and in this undergoes its transformations. The males are much larger than the females, for whose possession they frequently fight, using their snouts as weapons of offence. Two very curious species, *Diurus fureillatus* and *Taphrodites melli*, are figured above. *Brentus septentrionalis* is an American form which lives on the white oak.

BRENT WOOD, a small market town in the county of Essex, 17 miles from London on the Great Eastern Railway. As a market town and agricultural centre it enjoys a considerable and increasing prosperity. It has a richly-endowed grammar-school, founded by Sir Anthony Browne and Dame Jean, his wife, in the sixteenth century; some old houses; traces of a circular camp with a single vallum; and an old chapel, which was founded in 1221, is now converted into a national school. The population in 1881 was 4653.

BRESCIA or **BRESCHIANO**, a province of Lombardy, is bounded N.W. by Bergamo, N.E. by the Tyrol, E. by Verona, S.E. by Mantua, and S.W. by Cremona. The river Oglio and the Lake of Iseo, through which the Oglio passes, mark the boundary between Brescia and

Bergamo, and also between Brescia and Cremona. The province is 54 miles long from N. to S., and its greatest breadth from the Lake of Garda to the river Oglio is about 33 miles. The area is about 1643 square miles, and the population is 475,467. The territory, with regard to its surface and the nature of the soil, may be divided into three tracts—1. A mountainous district north of the town of Brescia, which is rugged and cold in winter; during the rest of the year great numbers of sheep and cattle are fed here, and much cheese is made. 2. The west coast of the Lake of Garda, called Riviera di Salò, which has a mild climate, and produces wine, oil, and fruit in abundance. In this part the properties are small; the peasants are, properly speaking, gardeners. About 12,000,000 lemons and 40,000 lbs. of laurel-oil are annually produced here. 3. The south part of the province, which forms part of the great plain of Lombardy, and produces corn, rice, Indian corn, flax, grass, and a great quantity of mulberry-trees. Besides the Oglio, which skirts the province of Brescia to the west and south, two rivers—the Mella and the Chiese—cross it from north to south, and drain the two principal valleys of its northern division. The Mella enters the Oglio near Ostiano; the Chiese enters it below Canneto. A canal issues out of the Chiese at Gavardo, passes close to the town of Brescia, and enters the Oglio above Canneto, whence the boats proceed by the Oglio into the Po.

Silk, linen, paper, leather, woollen and cotton goods, firearms, and cutlery are the most important manufactures of the province. The mountainous districts yield iron, copper, marble, alabaster, and granite. Education is well attended to. The number of primary schools is about 600; in these about 30,000 children are instructed.

BRESCIA (the Roman *Brigida*), the capital of the above province, is situated in a plain between the river Mella and the canal which joins the Chiese and the Oglio, and has 60,000 inhabitants. The city is nearly square, surrounded by walls about 4 miles in circuit, and has a castle on a hill inclosed with in the walls in the north-east of the town. It is a well-built town, has many fine churches embellished with numerous paintings by the great masters, principally of the Venetian school, and also with admirable pictures by Mantegna and other native artists. The rotunda of the old cathedral is a structure of the Longobards of the seventh century. The new cathedral is a splendid building. The town-house, the episcopal palace, the palaces and picture-galleries of the nobility, deserve mention. The Palace of Justice (*Palazzo Pubblico*), built on the site of an ancient temple, is curious as exhibiting that mixture of Gothic and Grecian architecture to be found in so many of the edifices of Northern Italy. The public library, founded by Cardinal Querini, a former bishop of Brescia, has 28,000 volumes. There are seventy-two public fountains in the streets and squares, which are supplied with water from the hills in the neighbourhood. The chief interest of Brescia is derived from its antiquities.

Brescia is the seat of a bishop and of the governor of the province. There is a lycœum, two gymnasiums, a college, a valuable library, and several other educational establishments in the town, besides the Ateneo, a literary and scientific society which publishes its transactions yearly; and a museum of antiquities is established in a Corinthian temple of Hercules, which was excavated in 1822. The temple, when, according to inscriptions, was erected by Vespasian, in A.D. 72 (*Tempio di Vespasiano*), stands on a lofty substructure with a projecting colonnade of ten columns and four piers to which the steps ascend. The substructions, piers of the steps, and the bases and parts of the shafts of the columns, in white marble, are still well preserved. The temple consists of three sections, each of which was dedicated to a different god (perhaps Jupiter, Juno, and Minerva). There is also a handsome theatre, and outside of the town a large building for the

annual fair, which begins on the 6th of August, and a cemetery in which the tombs are placed in rows one above the other against the walls. Brescia is an important mart for raw silk; it has considerable iron-works, and its manufactures of arms and cutlery are considered the best in Italy. It has also silk, linen, and paper factories, tanneries, paper and oil mills. This city is very ancient, and is supposed to have been the capital of the *Cenomani*. It subsequently became a Roman colony and *municipium*. It was sacked by Attila. Being declared by Otho I. a free city, it was governed for nearly 300 years by its own consuls; but being distracted by the contests of the Guelphs and Ghibellines, it placed itself in 1426 under the Venetian government. It was taken by the French during the League of Cambray, and, having revolted, was retaken by them by storm in 1512, when it was given up to military execution. On this occasion the Chevalier Bayard, the knight *sans peur et sans reproche*, was severely wounded. It has also been repeatedly laid waste by the plague and small-pox, and was in part destroyed in 1769 by the explosion of a powder magazine. During the ascendancy of Napoleon it was the capital of the department of Mella. The Congress of Vienna restored it, with the whole of Lombardy, to Austria; but the war of 1859, followed by the treaty of Villafranca, united the city, with the surrounding province, to Italy.

Brescia occupies a place of no little importance in the history of art, from having given birth to Alessandro Buonvicino, surnamed Il Moretto, in 1489, who appears to have studied exclusively at his native place, and whose teacher is said to have been Floriano Ferramola of Brescia. Friar Arnold, the precursor of the Reformation, was also a native of this town, and a statue was erected in his honour here and unveiled in 1882. He suffered martyrdom by burning in Rome in 1154.

BRESLAU, a large city at the confluence of the Ohlau and the Oder, the capital of the Prussian province of Silesia, stands 220 miles S.E. from Berlin, by the Berlin and Vienna Railroad, and had a population of 272,912 in 1880. The central part of the town contains the great market-place, from which the four main streets branch off to the four principal gates. The suburbs, separated by the Ohlau, but connected with the city by six large and several smaller bridges, are denominated the "Outer Town," in contradistinction to the central part, which is called the "New Town." The regularity and width of the streets, and the broad fronts and handsome elevation of the houses, give the town a cheerful appearance, which is in contrast with the massive and more sombre aspect of the churches and public buildings. There are three suburbs on the same side of the Oder as the New Town, a broad ditch crossed by a cast-iron bridge being interposed between them. On the north side of Breslau lie four other suburbs, built on two islands formed by arms of the Oder, and connected with the New Town by several bridges. The greater part of the town is encircled by an agreeable promenade, which is ornamented with trees and shrubs. In Blücher Square, which used to be called the Salzring, the exchange buildings are erected. A bronze statue of Blücher, resting upon a pedestal of granite, stands in this square.

Breslau contains numerous churches and a synagogue. The cathedral church, erected in the twelfth century, is highly decorated in the interior, and contains seventeen side chapels. The Church of the Holy Cross, erected by Henry IV., duke of Silesia, in 1288, is in the shape of a cross, and stands upon a subterranean church of the same shape and dimensions. Among the other remarkable churches are St. Mary's, on the Sand Island; St. Dorothea's, the loftiest church in Breslau; and the chief Protestant church, called St. Elizabeth's, the steeple of which is 350 feet high. The public buildings of the town are numerous. The Guildhall, erected in the fourteenth

century, contains the hall where the national diets formerly held their sittings; it is situated on the Parade, the finest square in Breslau. Among the other public buildings are the government house, the courts of justice, the public library in the Sand suburb, the Roman Catholic gymnasium, the episcopal palace near the cathedral, the arsenal, the burg (once an imperial palace), and the university buildings. The university was founded by Leopold I. in 1702 as a Jesuit college, for the two faculties of divinity and philosophy. Two more faculties, for law and medicine, were added in 1811, when the University of Frankfort on the Oder was incorporated with it. The library contains upwards of 300,000 volumes. The Protestants have three gymnasia here; the Catholics have a royal gymnasium and an establishment for educating their clergy. The Jews have a good school, founded in 1790, and another of an inferior kind. Breslau likewise possesses a school of arts, a school of architecture, and a vast number of other schools and charitable institutions, among which must be mentioned the asylums for the blind and for deaf mutes, the Silesian literary and scientific society, several public libraries, various collections of coins and works of art, and several hospitals and infirmaries. The town is the seat of a royal mint and bank, and has a head department of mines, and other establishments incidental to its character as the centre of provincial government. There is a theatre and opera-house, and several musical societies. Breslau is the residence of a Roman Catholic prince-bishop.

The central position of Breslau among the manufacturing districts of Silesia, its facilities for trade by means of internal navigation, and by railroads which connect it with Vienna, Prague, Dresden, Leipzig, Hanover, Hamburg, Berlin, and Stettin, render it one of the most thriving manufacturing and commercial cities of Europe. It is an entrepôt for the fine and coarse woollens, cottons, linens, silks, hardwares, glass, wools, hemp, and flax of Silesia, for the wines of Hungary, and all kinds of colonial produce. The oxen of the Ukraine and Moldavia, the corn and cattle of Silesia, and the produce of its own distilleries, tan-yards, type-foundries, and all those manufactures which it has in common with other large towns, find a regular sale at Breslau. Several fairs are held in the year.

Breslau, the Vrattislaw of the Latins and the Wracław of the Poles, was a town and episcopal see as early as 1000 A.D. It belonged to Poland down to 1163, after which it became the capital of the independent duchy of Silesia. In 1261 Duke Heinrich III. introduced the then famous municipal law of Magdeburg. On the extinction of the dukes in 1335 it was annexed to Bohemia, and became subject to the emperors of the Luxemburg family. In 1523 the citizens embraced the Reformation, and having fallen under the Austrian supremacy in 1527, they were compelled to defend their privileges. In 1741 Frederick the Great marched into Silesia and took Breslau by surprise. In 1757 the town was again occupied by the Austrians, but was recaptured by Frederick after the battle of Leuthen. In 1806-7 the town was besieged by Vandamme, who took it and levelled the fortifications. In March, 1813, Breslau was the scene of an enthusiastic rising against the French, on which occasion Frederick William III. issued his famous appeal, "An mein Volk." Since the termination of that war the city has rapidly increased.

BRESSAY or **BRESSA**, one of the Shetland Isles, on the east coast of Scotland. The island produces peat and slates, and the inhabitants are chiefly employed in fishing. Bressay Sound is one of the finest natural harbours in the world.

BRESSE, a district in the former province of Burgundy in France. It was bounded N. by the duchy of Bourgogne and Franche-Comté, E. by Bugey, S. by the Rhone (which divided it from Dauphiné), and W. by Lyonnais and the Saône. It was obtained by exchange from

Savoy in 1601. Bresse now forms part of the department of AIN. Bourg was its chief town.

BREST, a town in the department of Finisterre in France, and one of the great naval stations of that country, stands on the Penfeld, at a distance of 325 miles W. of Paris by railway, and had 66,110 inhabitants in 1882. It lies on the north side of a deep bay, called the Road of Brest, landlocked, and entered by a narrow channel called Le Goulet.

The town is of triangular form. The Penfeld enters it at a point near the northern angle of the walls, and passes through it into the roadstead with a winding course, dividing it into two parts, that on the left bank being called Brest, and that on the right Recouvrance. In Brest, just at the point where the river falls into the roadstead, and placed so as to command the entrance to the port, is the castle which belonged to the dukes of Brittany. It was besieged in vain by Duguesclin and Clisson, and was long held by the English. It was surrendered by Richard II. in 1395, in consideration of 12,000 crowns. The whole town is strongly fortified. The site of Brest is very uneven; so steep is the declivity in some parts that the communication is made by means of steps, and the gardens of some of the houses are on a level with the second or third story of others. The streets in the higher parts of the town are winding and steep. In Recouvrance modern houses are rapidly superseding the Gothic edifices of former times.

Brest is a fortress and naval station of the first class. Previous to the time of Louis XIV. it was a land fortress merely, but Cardinal Richelieu, perceiving its importance as a naval station, caused magazines to be built and fortifications to be erected to defend the harbour. Louis XIV. afterwards established the great arsenal. All the principal buildings of the town, except the Churches of St. Louis and St. Sauveur, are connected with the defence of the place or for the purposes of the French navy. There are handsome quays, shipbuilding yards, extensive storerooms, rope walks, and barracks. The Bagnes, or Lulks for convicts, no longer exist, the prisoners having been removed in 1860 to the penal colony of Cayenne. The buildings now serve as storerooms for hemp and canvas. The various establishments for the navy occupy nearly the whole of the port. Brest has a botanic garden, a marine library, an observatory, and a museum of natural history. It is the seat of a maritime prefect, has schools of medicine, navigation, and marine engineering, tribunals of first instance and of commerce.

Brest is connected with the suburb of Recouvrance by means of a massive iron swing bridge, 56 feet above high-water mark, in two divisions, and 317 feet long between the piers.

The bay or road of Brest is perhaps one of the finest natural harbours in the world. It lies between the great promontory of Finisterre on the N. and the smaller peninsula of Quern on the S. The passage, Le Goulet, by which it is entered is only 1749 feet in width, and the Mengant rock, rising in the midst of this channel, contracts the entrance still more, and compels vessels to pass close under the guns of batteries which line it on either side, and command it by a cross fire. The roadstead is about 15 miles long, and in some places 3 miles broad, and the area of its surface is estimated at 15 square leagues. Although there are several sandbanks and shoals, 200 vessels can anchor within it. The upper part contains numerous creeks called Anses. It is rather exposed to the N.W. winds. The passage is defended by formidable fortifications on both sides. At its entrance, on the Point St. Matthieu there is a lighthouse with a revolving light which is eclipsed every half-minute; its height is 177 feet above the sea. The inner port consists of a long narrow creek formed by the river Penfeld. Its mouth is closed by a boom, and

defended by powerful batteries. It has 25 feet of water at low tide; mean spring rise of tide, 19 feet 1 inch. Around the harbour run quays of great extent, alongside which the largest ships can lie, and five artificial basins are excavated out of the rock.

In 1865 a new harbour (Port Napoleon III.) was opened, by which the commerce of the town has since been somewhat considerably increased. The old mercantile harbour was taken possession of by the government and added to the dockyard. A sum of £40,000 is voted annually to maintain and improve the harbour, and £600,000 was expended during the empire for that purpose. The trade consists entirely of imports for the supply of the dockyard, town, and interior of the department, there being few manufactures to export. In 1866 the railway was opened throughout from Paris to Brest. This town is affirmed by some authorities to be the *Briates Portus* of the Romans, but of this there is considerable doubt. It was of little consequence till it was fortified by a duke of Brittany in the eleventh century. It was assigned to the English in 1372 by John IV., duke of Brittany, and was held by them till 1397. In 1489 it was taken by the French, and was soon after permanently united to the monarchy by the marriage of Charles VIII. with Anne of Brittany. It was at Brest that Mary Queen of Scots landed on her way to St. Germain, in 1518. Cardinal Richelieu, being sensible of its great natural advantages for a naval station, began in 1631 the construction of the fortifications and magazines, which were completed by Vauban in 1680. In 1694 an English and Dutch force that had attacked Brest was defeated with great loss. From this action a creek has obtained the name, "La Mort à l'Anglais." Outside the Goulet, about 10 miles off, is Ouessant or U-shant light, at the mouth of the Channel, where is the dangerous strait called Chenal du Four, beset with rocks, between the mainland and the gulf islands of Beniguet, Molène, and Ouessant. The last is supposed by some to be the *Ultima Thule* of the ancients. Its inhabitants remained idolaters down to the seventeenth century. The indecisive naval action of Uslant was fought off this island (1778) between the French fleet under D'Orvilliers and the English under Keppel and Palliser.

BRETIGNY, a village of France, in the department of Eure-et-Loir, on the railway between Paris and Orleans. It is celebrated in history as the place where Edward III. concluded a peace with France in 1360, by which John II., king of that country, was released from his captivity in England on agreeing to pay 3,000,000 crowns for his ransom, England renouncing her claims to Normandy, Anjou, Maine, and Touraine, but being confined in her possession of Gascony, Guienne, and several other parts in France which had just been acquired by conquest.

BRETSCHNEIDER, HEINRICH GOTTFRIED, a German satirist, was born at Gera 6th March, 1739. He was educated at the Institute of Herrnhuters at Elbersdorf, and afterwards at the Gymnasium of Gera. He entered the Prussian army during the Seven Years' War, becoming a captain of horse in a volunteer corps, and was taken prisoner by the French and confined until the peace of Hubertsburg in 1763. In 1775 he travelled in England, France, and Holland, and in 1778 became librarian to the University of Osnabrück. While holding this office he was persecuted by the Jesuits, whose enmity he had excited; but he was befriended by Joseph II., who gave him the appointment of inspector of studies in 1782. He had several changes of position after this, and finally died at Krziminiz near Pilsen in Bohemia, 1st November, 1810. He was the author of tales, poems, and satires. Of the latter, his "Almanach der Heiligen auf das Jahr, 1788," with copperplates and music, is a severe attack upon the priests and monks, the legends of the latter being especially ridiculed. In 1774 he also assailed the *Wertherism* prevalent in Ger-

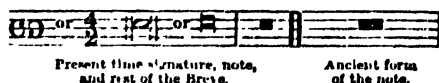
many, and it is said the materials for the "Voyages" of Nicolai were furnished by Bretschneider.

BRETSCHNEIDER, KARL GOTTLIEB, an eminent German theologian of the present century, was born at Gersdorf, in the territory of Schönburg, 11th February, 1776. He was educated at Chemnitz and Leipzig, and settled at Wittenberg in 1804 as an academic teacher, delivering lectures in philosophy and theology. In 1807 he became chief pastor at Schneeberg, and in 1816 general superintendent at Gotha. In 1840 he was made upper consistorial councillor. He died on 22d January, 1848. During his life he was the principal representative of the so-called "rational supernaturalism" which endeavoured to hold a middle position between Church orthodoxy and the rejection of the supernatural element in religion. His literary activity was indefatigable, and his published writings in various departments of scientific theology are very numerous. In dogmatic theology his "Handbuch der Dogmatik der Evangelische Lutherischen Kirche" (Leipzig, 1814) reached a fourth edition in 1848, and his "Systematische Entwicklung aller in der Dogmatik Verkommenen Begriffe," &c. (Leipzig, 1805-41), is still considered in Germany an indispensable help to the scientific student. In philology his principal work was one of great value, the "Lexicon Manuale Græco Latinum in libros Novi Testamenti" (Leipzig, 1821-40). But of all his works the most valuable and important was his editing the first fifteen volumes of the "Corpus Reformatorum," the first eleven of which furnish the most authentic and ample materials for the life of Melancthon and the history of the German Reformation. Only one of his works, "The Manual of the Religion and History of the Christian Church," has been translated into English (1857).

BREVE, in music. *Nota brevis* ("the short note") seems an odd name for a note of music of such great duration that it is rarely seen. An accomplished musician may play modern music all his life without seeing one; but directly he passes from the compositions of the present day to those of the past his studies will supply him with examples of breves in moderate quantity. The present longest note in actual use is the semibreve ("the half-short"), and the minim ("the tiniest") is far more common than that.

In mediæval music notes were *longest, long, and short*. As the music grew merrier, and the skill of players and of instrument makers, as well as of singers, increased, notes of shorter and shorter length were required. The old notes dropped out of fashion one by one, and are now found only in the curiosities of ecclesiastical libraries; so that in time even the breve went its way, and the semibreve has come to be the unit of time. A breve now either measures two bars, or one bar of the almost obsolete time "alla breve" (four minims in a bar); and this last it is now customary to divide into half bars of two minims each. [See *ALLA BREVE*.] For further consideration of the subject see *TIME, NOTATION OF MUSIC*.

The breve, in round and in square form (both of which are of the same value), its rest, and its time are given below.



The ancient form (thirteenth century) lasted about two centuries in general use, and is still used in churches "standing in the ancient ways," or using the old MS. service-books. The traveller admiring these, however, as they stand on the great lecterns in actual use in Italian cathedrals, is told, if he cares to inquire, that the singers use modern printed manuals, and that the ancient pages are turned over for form's sake—perhaps even he who turns the leaf being unable to decipher the music.

BREVET, in France, denotes any warrant granted to an individual in order to entitle him to perform the duty to which it refers. In the British service the term is applied to a commission which confers on an officer a degree of rank immediately above that which he holds in his particular regiment, without giving a title to receive the corresponding pay. Brevet rank does not exist in the navy, and in the army it neither descends lower than that of captain, nor ascends above that of lieutenant-colonel. An officer who has served five years as lieutenant-colonel is entitled at the end of that term to promotion to the rank of brevet-colonel (without increase of pay). Brevet rank is also given as the reward of some particular service not so important as to deserve an immediate appointment to the full rank; it, however, qualifies the officer to succeed to it, on a vacancy, in preference to one not holding such brevet rank.

Something similar to the brevet rank above described must have existed in the French service under the old monarchy, for according to Père Daniel (tom. ii. p. 217, 227), the colonel-general of the Swiss troops had the power of nominating subaltern officers to the rank of captains by a certificate which enabled them to hold that rank without the regular commission.

BREVIARY, or canonical hours, the name of the daily service-book of the Church of Rome, consisting of the night office of matins and the seven day offices of lauds, prime, tierce, sext, none, vespers, and compline, the day services being arranged in harmony with the passage in Psalm cxix. 164—"Seven times a day do I praise thee."

The origin of the name is variously accounted for, some deriving it from the little books of psalms and lessons read in the choir, collected out of large volumes, which the old monks carried with them in their journeys; others from the shortened service which was used in the papal palace of the Lateran, and afterwards brought into general use. The books from which the Breviary was originally compiled consisted of—(1), the Psalter, which included the Psalms of David, the Te Deum, the Athanasian Creed, &c.; (2), the Bible; (3), the *Antiphonarium*, containing the anthems and responses; (4), the *Hymnarium*, or Hymnal; (5), the *Collectarium*, a book of collects or short prayers; (6), the *Homiliarium*, a collection of homilies written by the fathers; and the *Passionarium* and *Martyrologium*, or books of the acts and sufferings of the martyrs. As previous to the Council of Trent each bishop had authority to regulate the breviary in use in his own diocese, and most monastic establishments had books of their own, there was for a long period a great variety in breviaries. They may, however, be reduced to four principal classes—viz. the Roman, the Gallic, the Mozarabic (or Old Spanish), and the Anglican.

By the bull of Pope Pius V., issued in 1568, the use of all other breviaries was abolished in favour of the Roman, exceptions being allowed to those which could show a use of 200 years. The morning and evening services of the Church of England are abridgments, with omissions and additions, of the matins, lauds, and prime, and of the vespers and compline, of the ancient breviaries of Salisbury and York. In Roman Catholic countries at the present day the Roman breviary is almost universally used, the exceptions being chiefly in a few old churches which have continued the use of their own peculiar compilations.

BREWING. See BEER.

BREWOOD, a village in Staffordshire, formerly a market-town, $10\frac{1}{2}$ miles S. by W. from Stafford, and $134\frac{1}{2}$ from London, being $2\frac{1}{2}$ miles from the Four Ashes station of the London and North-western Railway. It is neatly built, and contains a church with a handsome spire, and a well-endowed free grammar-school, which was rebuilt in 1866. The population of the parish, which contains 11,950 acres, was 2948 in 1881.

BREWSTER, SIR DAVID, an eminent philosopher, and one of the most distinguished physical inquirers of the

present century, was born at Jedburgh on 11th December, 1781. His father, who was rector of the grammar-school there, destined him, with his three brothers, for the ministry; he was accordingly sent to the University of Edinburgh, and remained there several sessions. He passed through the theological classes and took a license as a preacher, but delicate health and a great love for scientific pursuits induced him to turn completely to science as his aim in life. He declined a presentation offered him by the Duke of Roxburgh, and devoted himself principally to the science of optics, in which he was destined to attain the highest reputation. In 1800 he received the honorary degree of M.A., and in 1807 scientific honours poured in upon him. He was made LL.D. of Aberdeen University, Oxford conferred on him the degree of D.C.L., and Cambridge that of A.M. Next year Brewster was elected a member of the Royal Society of Edinburgh, of which he subsequently filled the offices of secretary, vice-president, and president. In the same year (1807) he took in hand the editing of the "Edinburgh Encyclopædia," to which he made a number of important scientific contributions till its completion. In 1813, under the title of a "Treatise on New Philosophical Instruments," he presented to the public some of the results of his optical researches during the preceding twelve years. He had bestowed some attention upon the experiments prosecuted by Buffon for the purpose of discovering the nature and emulating the effects of the burning-mirrors of Archimedes; and these experiments suggested to him the construction of what he styled "polyzonal" lenses for light-lenses, so as to strengthen the light and transmit it to a greater distance. The invention, or adaptation of Buffon's invention, excited a good deal of interest, but it was not then practically taken up in England until 1835, though it was in France, where Fresnel appropriated the discovery without knowing that he did Brewster a wrong. In 1815 he sent to the Royal Society of London a paper "On the Polarization of Light by Reflection," and was elected a fellow and received the Copley medal for his discoveries and researches. In 1816 he received from the French Institute half of the prize of 3000 francs awarded for the two most important discoveries made in Europe in physical science during the two years preceding. In that year he also invented the kaleidoscope, an instrument which became popular, although, owing to the defects of the patent laws, he never reaped much pecuniary benefit from it. He next rendered the stereoscope—the principle of which had been discovered by Wheatstone—an applicable and useful instrument, chiefly through the skilful employment of semi-lenses. In 1819 he, in connection with Professor Jameson, started the *Edinburgh Philosophical Journal*, which was continued till 1824, and from that year was carried on by himself alone under the title of the *Edinburgh Journal of Science*. In 1819 the Royal Society awarded him the Rumford and the Royal gold and silver medals for further discoveries in the polarization of light. The Royal Society of Edinburgh twice awarded him the Keith prize for his discovery of two new fluids in minerals, and for his analysis of solar light. In 1829 the Institute of France elected him a corresponding member, and similar distinctions were bestowed on him by the Royal Academies of Russia, Prussia, Austria, Sweden, Denmark, Italy, and Belgium. American scientific bodies also sought the honour of enrolling him among their foreign associates. In 1831 appeared his "Life of Sir Isaac Newton," and in the same year he assisted in effecting, if he did not originally suggest, the formation of the British Association, at York. In this year he received the Guelphic order, and in 1832 was knighted by King William IV. In 1835 a "Life of Flamsteed" was published, which contained serious aspersions against Sir Isaac Newton. Brewster made every effort to obtain evidence to confute these statements, and to publish an enlarged edition of the

"Life of Newton," which appeared in 1855. To the distinctions we have previously enumerated as falling to his share, the King of Prussia added (in 1847) the Order of Merit. In 1849 he was elected one of the foreign associate members of the Institute of France, in the place of the chemist Berzelius; and the Emperor Napoleon (in 1855) conferred upon him the Cross of the Legion of Honour. In 1859 he was unanimously elected principal of the University of Edinburgh; and after having been secretary of the Royal Society of Edinburgh and vice-president for many years, he was elected its president in 1864. He died 10th February, 1868, in the eighty-seventh year of his age.

Besides his great work, "The Life of Sir Isaac Newton," Sir David Brewster was the author of several popular books, "Natural Magic," "The Martyrs of Science," and "More Worlds than One, the Creed of the Philosopher and the Hope of the Christian," which was a reply to Dr. Whewell's essay on "The Plurality of Worlds." He was twice married—in 1810 to Juliet, the younger daughter of James Macpherson, M.P., and in 1857 to Jane, daughter of Mr. Thomas Parnell, of Scarborough, who survived him. A "Home Life" of Sir David, by his daughter, Mrs. Gordon, was published in 1870.

BRIAN BORU' or BOROIMHEE, a celebrated king of Ireland. He ascended the throne of both Munsters—that is, of Ormond and Thomond, or the present counties of Tipperary and Clare—in 978. His earlier exploits were against the Domes of Limerick and Waterford, but eventually he became himself monarch of Ireland. He derived his surname from the tribute (the *boroimhe*) which he now imposed upon the provinces. On these and other revenues King Brian supported a rude but royal magnificence at his chief residence of Kineora, near the present town of Killybeg, in the county of Clare. He continued for many years to rule his dominions with vigor and prosperity. The King of Leinster, Maelmora, having revolted, and invited a new invasion of Danes to his assistance, the battle of Clontarf took place, in which King Brian fell, after gaining a glorious victory over the united forces, on Good Friday, 1014. (O'Connor, "Rev. Hist. Sculp. Vet.")

BRIANÇON, a town in the department of the Hautes Alpes, France. It is a fortress of the first class, on the right bank of the Durance. The town is defended by seven forts, built on heights of different elevations above the town; five of these are on the left of the chasm at the bottom of which the Durance flows, and communicate with the town by means of a bridge of a single arch 129 feet in span, and 168 feet above the water, and with each other by passages cut within the solid rock. Briançon is considered one of the strongest towns in the world, and the Fort d'Infernet, which is 7809 feet above the level of the sea, is the highest fortress, and with the exception of the hospice of the Great St. Bernard, the highest place constantly inhabited in Europe. In the town, which has a population of 3960, there is a tribunal of first instance and a college. Nails, scythes, pencils, hosiery, bonnets, cotton, and leather are made, and the chief trade is in these, together with wool, tallow, and lavender water. Briançon is a city of high antiquity. Many attributed its foundation to the Greeks drawn from the borders of the Lake of Como; others have given its foundation to Bellicus or Brennus. Ammianus Marcellinus calls it *Virguntia Castellum*. It held a Roman garrison. It was united to France in 1319, having been an independent republic from the time of the fall of the Roman empire. In allusion to its brave resistance to the allies in 1815, the two gates bear the proud motto, "Petite ville, mais grand renom."

BRIAN'SK, a town of Russia, in the government of Orel, situated on the Dnieper, opposite to the mouth of the river Snezheta. There are thirteen churches, of which the cathedral dates from 1526, an arsenal, and an hospital. It has a considerable trade in wood, pitch, linseed oil, and

cattle, and manufactures of tobacco, bricks, and tallow, and a brewery.

BRIBERY, in English law, has a threefold signification, first, the offence of a judge, magistrate, or any person concerned in the administration of justice, receiving a reward from parties interested, for the purpose of procuring a partial and favourable decision; secondly, the receipt or payment of money to a public ministerial officer as an inducement to him to act contrary to his duty; and thirdly, the giving or receiving of money to procure votes at parliamentary elections or elections to public offices of trust.

1. By 2 Hen. IV. "all judges, officers, and ministers of the king convicted of bribery shall forfeit treble the bribe, be punished at the king's will, and be discharged from the king's service for ever." The person who offers the bribe is guilty of misdemeanour. The corruption of the English judges in the earlier periods of our history was notorious and unquestionable; but since the Revolution in 1688 judicial bribery has been unknown in England, and no case is reported in any law-book since that date in which this offence has been imputed to a judge in courts of superior or inferior jurisdiction.

2. Bribery in a public ministerial officer is a misdemeanour at common law, in the person who takes and also in him who offers the bribe. Bribery, with reference to particular classes of public officers, has become punishable by several Acts of Parliament.

Any attempt to bribe a member of a jury, in order to influence his verdict, is a high misdemeanour, and this includes the making of any promise, the offer of money, entertainment, and indeed anything that savours of corruption. If a juror takes a bribe he renders himself liable to fine and imprisonment, and the payment of ten times the amount of the bribe in addition.

By the Customs Consolidation Act, 16 & 17 Vict. c. 101, s. 262, the bribing or corrupting any officer of the customs or excise, in order to induce him to neglect his duty, renders the offender liable to a fine of £200. An earlier statute, the provisions of which still remain in force, enacts that any excise officer who takes a bribe to neglect his duty shall be liable to a fine of £500 for each offence, shall forfeit his appointment, and shall be rendered for ever incapable of serving the crown in any employment or office.

3. As to bribery for votes at elections. This is a form of corruption which has attended political contests in England ever since the beginning of the eighteenth century. During the greater part of this period it was reduced to a regular system, and was so widely spread and so strongly supported both by candidates and electors as to defy the efforts of the legislature towards its suppression. Numerous Acts of Parliament have been passed to this end, from the 7 & 8 Will. III. c. 4, called the Treating Act, down to the Parliamentary Elections Act of 1868 (31 & 32 Vict. c. 125); but notwithstanding the heavy penalties imposed upon both the givers and receivers of bribes, and the disfranchisement of several boroughs for corrupt practices, there is abundant evidence that it still exists in some of its forms, both from the revelation made in hearing election petitions, and from the heavy sums expended by some candidates for election expenses. It was thought that the passing of the Ballot Act of 1872 would effect the removal of bribery at elections, from the impossibility of insuring the completion of the bargain by the voter, and this was one of the chief arguments advanced by the advocates of that measure, especially as now aided by the stringent provisions of the Corrupt Practices Prevention Act, 1883. The result up to the present has hardly realized these anticipations. The practices both of bribery on the one hand, or of intimidation on the other, have been found to be too deeply rooted to be readily destroyed; but there can be little doubt that in time that measure will for the most part achieve the objects for which it was passed. With regard to bribery,

It has been proved to have had the effect of enabling voters to promise both sides and obtain double pay, and then to vote for either with impunity—thus at least making the practice uncertain and doubly expensive.

The present law on this subject is contained in the Parliamentary Elections Act, 1868, and the Corrupt Practices Prevention Act, 1883, the tendency of the latter statute being to render the law upon the subject much more stringent and severe. Any gift or promise of money or valuable consideration, or the gift, promise, or procurement of any place, office, or employment, in order to influence votes, is bribery in both giver and taker; as is also the payment of parochial rates by the candidate, in order to obtain for another person the privilege of voting. If the offence is reported by the judge to have been committed by or with the knowledge and consent of any candidate, such candidate will be incapable of ever being elected or sitting for the constituency in which the bribery is committed, and of sitting in the House of Commons for seven years, and of voting at an election and holding a public office for a like period. A candidate found guilty of bribery through his agents is rendered incapable for seven years of representing the constituency in which they were committed. Any person convicted on indictment of bribery is liable to imprisonment with or without hard labour for a year, and to a fine of £200. Treating electors to food and drink entails the same penalties; and it is illegal for a candidate to pay for the conveyance of voters to the poll, or to purchase or hire bands, torches, flags, or ribbons for election purposes. Electors hired by the candidates as messengers must not vote, and the number of committee-rooms, and in fact the total payments for all purposes of an election, are strictly limited and defined. See CORRUPT PRACTICES ACT, 1883.

Questions of controverted elections were until the year 1770 decided by the whole House of Commons. The Granville Act was then passed, and under its provisions committees were appointed by lot for the trial of election petitions, and this system was continued, with various modifications, until 1839, when the members of these election committees were *selected*, individual responsibility being increased by a reduction of their numbers. By the 7 & 8 Vict. c. 103 (1844), the committee was reduced to five, including the chairman; but by the Parliamentary Elections Act of 1868 election committees were abolished, and the law on this subject was completely changed.

Under this statute election petitions must be presented to one of the superior courts of law within twenty-one days after the election. Under the Corrupt Practices Act of 1883, however, a petition alleging illegal practices may be presented within forty-nine days of an election; or if alleging illegal payments subsequent to an election, then within twenty-eight days of such payment. The Act of 1868 provides that before the presentation of a petition the petitioner must enter into recognizances in £1000, with not more than four sureties for payment of costs and expenses.

An additional judge was appointed to each of the three courts of Westminster; and the trial of election petitions must be conducted by three of the puisne judges of each court in rotation (the chief justices being specially excepted from the duty). It is also enacted that a fourth judge shall be associated for that purpose, if necessary.

Every petition is to be tried by the judge, sitting in open court, without a jury; and, except under very peculiar circumstances, this inquiry is to be held within the limits of the borough or county where the election took place. At the conclusion of the trial the judge has to determine whether the member whose return is complained of, or any, and what other person was duly elected, or whether the election was void; and such decision is held to be "final to all intents and purposes." The verdict of the court is

reported to the speaker of the House of Commons, accompanied by a certificate stating whether corrupt practices have been proved against any individual, and also whether there is reason to believe that they have extensively prevailed during the election; and upon this further report the house makes such order as it thinks fit.

The judge has the same powers, jurisdiction, and authority as a judge of one of the superior courts, or of assize or nisi prius; witnesses being subpoenaed and sworn in the same manner as in a trial at nisi prius, and subject to the same penalties for perjury. A petition cannot be withdrawn without permission of the judge, on special application being made; and the circumstance of all such withdrawals are to be reported to Parliament.

Penalties are also provided by law for the punishment of corrupt practices at municipal elections, and by the Corrupt Practices (Municipal Elections) Act of 1872 (35 and 36 Vict. c. 60) a tribunal is appointed for the trial of the validity of such elections. The penalty imposed upon any candidate who is found guilty is the rendering of his election void, and in addition (and this applies to any candidate, whether elected or not, who has been found guilty) he is rendered incapable of holding any municipal or parliamentary office or franchise, of voting in a parliamentary election, of being employed by any candidate in any parliamentary or municipal election, or of becoming an overseer or guardian of the poor.

BRICK, the well-known substitute for stone in building and paving. Brick is made of a mass of clay usually mixed with sand, fine coal ashes, small coal sifted, or other ingredients, tempered with water, shaped into convenient forms in a mould, and subsequently dried in the sun, and, in most cases, burned or baked in a clump or kiln.

The ancients used bricks both baked and simply dried in the sun. Those found in the ruins of Babylon are among the oldest specimens existing. In the article BABYLONIA is an account of the great use of bricks as materials for writing by the interesting inhabitants of that early land. The Egyptians used sun-dried bricks, and the process of making them is represented in their paintings, some of which are peculiarly interesting from the light they throw upon the Scripture narrative of the servitude of the Israelites. The Romans, according to Pliny, began to use bricks about the decline of the republic; but there are yet remains of a brick building, called the temple of the god *Fedolus*, which is said to have been built on occasion of the retreat of Hannibal. It has been supposed that the Greeks did not use bricks until after their subjugation by Rome; but passages from Vitruvius and other writers show that bricks were in use before that period. The Greek names for bricks were *didoron*, *pentadoron*, and *tetradoron*, terms formed from *doron*, a hand breadth, and describing their size as equal to so many hand-breadths. They appear to have been used simply dried, as Vitruvius speaks of their requiring two years to dry, and of the laws of Attica requiring that five years be allowed for that purpose, and because, further, he warns against using them too new for fear of their shrinking. Roman bricks (*lateres*) were very thin in proportion to their length and breadth, and were usually well burned; but sun-dried bricks, or raw bricks, as they called them, were also used (*lateres crudi*). They resemble tiles more than modern bricks, and are formed of various dimensions, from $7\frac{1}{2}$ inches square and $1\frac{1}{2}$ inch thick, or even smaller, to about 1 foot 10 inches square and $2\frac{1}{2}$ inches thick. The tiles employed so frequently by the Romans for casing interior wall surfaces are large thin squares of terra-cotta, and they generally were decorated on one side with incised figures and patterns. They were very often pressed into soft plaster, so that the edges came in line and formed diagonal series, making the so-called *opus reticulatum*.

The small paving-tiles so well known as *tesera* and

tessellæ—the latter term a diminutive of the former—the components of *tessellated pavements*, declare their square form under their title, which is evidently derived from the Greek *tessares*, four. They were made by cutting larger tiles into small cubes, or else they were formed in the first instance in distinct moulds. They vary in size from about 1 inch down to $\frac{1}{2}$ inch square. The red portions of the mosaic work of pavements were produced by these small terra-cotta cubes, which were also used, though less frequently, in the formation of Roman mosaics for other purposes. It may be observed that of the Roman tessellated pavements which are now known to be in existence none are earlier than the Augustan age, while the greater number date from the succeeding century.

One other distinctive application of their large flat tiles by the Romans is their use of them both in the formation of their graves and for preserving their commemorative monumental inscriptions. In close conformity with the Greek usage, some tiles laid flat formed the flooring upon which the body might rest, and others set sloping in opposite directions provided a simple ridged covering to protect it from the superincumbent earth. The vases that contain burned bones are sometimes found to have been protected in a similar manner. The inscribed tiles, having their Greek or Latin legend generally written across them from side to side, were placed very much in the same manner as modern gravestones.

The inscriptions that are preserved upon the various tiles that have come down from the Roman times abound in highly interesting as well as very valuable information. Considerable numbers are inscribed with the names or initials of the consuls of the year when they were manufactured. They appear to have been thus stamped, in conformity with some law of about the time of Trajan, as a guarantee of the quality of the clay used in the fabrication of them. Large collections of these tiles, obtained from almost every great edifice of ancient Rome, are still in existence, and many are yet in use upon the roofs of the churches of the modern city. The tile-inscription, whatever its character, was produced from a stamp or die in a low sunk relief, the raised letters being on a level with the face of the tile itself. In the centre of the circular composition upon a tile now in the British Museum is a small medallion formed of a figure of victory, which was the mark of the potter; this is encircled by two bands of letters; those of the outer band are larger than the others, and with them the inscription commences. It may be read thus:—*OPUS DOL (IARE) DE FIGUL (INIS) PUBLINIANIS (EX) PREDI AEMILIAES SEVERAES*—*Pottery from the Publinian potteries, from the estate of Aemilia Severa.* This, though a characteristic, is by no means a perfect specimen of these remarkable inscriptions. The most complete stamps have the date of the emperor or of the consulship, the name of the estate which supplied the clay, that of the pottery which baked it, and of the potter who prepared it, sometimes even of the slave who moulded the tile, and the very dimensions of the tile itself. In a few instances also the tiles have inscriptions indicating the places where they were to be used. The route of the twenty-second legion has been traced through Germany by the tiles that lingered at its successive stations; and in this country these tiles have declared what legions they were that occupied quarters at places most distinguished in Roman Britain. Thus the tiles of the sixth and ninth legions have been found at York; those of the twentieth, "Valerian's Victorious," at Chester; and others of the second at Caerleon.

In Persia bricks are used both sun-dried and baked. The latter resemble English clamp burned bricks; but the former are like the Egyptian bricks, mixed with straw cut fine, to give them greater tenacity.

The cheap and convenient mode of building with bricks

was rendered possible by the use of the arch, an invention which, although known to the Babylonians, to the Egyptians, and through them to the Greeks, was never thoroughly understood or brought to perfection until the Romans developed it. In the articles *ARCH*, *AQUEDUCT*, *AMPHITHEATRE*, their stupendous works are referred to. Caligula began to throw a mighty brick arch across from the Palatine to the Capitol, a span which would be cautiously entered upon even by present engineers, and there is no doubt he would have accomplished it if his murder by an enraged people had not checked his costly eccentricities. But the Roman habit was to face the buildings thus erected with costly marbles, or with fine stone. The Colosseum, the Pantheon, &c., are therefore merely the brick skeletons of superb edifices; and if the skeletons are thus lovely, what must not the finished buildings have been? In England, more especially in London, brick is the true building material, and it says much for the future of *ARCHITECTURE* (see the remarks in that article) that the beauty of this humble material is now being discovered. With the addition of mouldings made by grinding down bricks, of moulded tiles, and of terra-cotta (that is, fine brick) ornamentation, red brick has come to be a highly ornamental and truthful architectural material. Indeed, so fresh and characteristic is the development of what is called the "Queen Anne" style of building (though the daughter of James II. would be surprised to find herself in any way connected with beauty in art) that mansions of red brick are frequently found in those parts where stone abounds—a flagrant violation of first artistic principles.

In making ordinary English bricks the top soil or *encaillou* is first removed from the clay, which is dug and turned over in the winter. Exposure to wet and frost prepares it for use by the spring, when fine ashes are added to it in the proportion of one-fifth ashes to four-fifths clay, or 60 chaldrons to 240 cubic yards, which will make 100,000 bricks. When much sand is mixed with the clay, forming what is called a mild earth, a smaller proportion of ashes may be used. This quantity requires the addition of about 15 chaldrons, or, if mild, of about 12 chaldrons of *breeze*, which is a kind of coarse coal-ash, separated by sifting to aid the burning. The clay and ashes being roughly mixed and watered, the mass is removed in barrows to the *pug-mill*, which consists of an upright barrel in which a series of strong iron knives and teeth are caused to revolve by the power of a horse walking in a circular path, so as to cut and masticate the clay very thoroughly as it passes from the top of the barrel to an aperture provided for its exit at the bottom. As the clay oozes out of the mill it is removed with a *cuckhold* or concave shovel, and covered with sacks to prevent its drying too fast. A person, called the feeder, takes from the stock of clay thus prepared a piece about the size of a brick, covers it with sand, and passes it to the moulder, who throws it with some force into a wooden mould of the size and shape of the brick, which mould is previously sanded. Having tilled the mould, the moulder cuts off any superfluous clay with a stick kept in a bowl of water by his side, and then removes the mould, after which the soft brick is carefully transferred from the bottom board of the mould to a pallet-board, and when a sufficient number have been moulded is conveyed with others to the *hacks*, which are long level lines raised about 4 inches from the surface of the field, and formed about 2 feet 6 inches wide. The upper surfaces of the bricks are previously sanded, and great care is taken to avoid twisting or otherwise injuring their shape in transferring them to the hacks, on which they are laid in two rows, with a little space between each to allow the free circulation of air. When partially dried the bricks are removed, placed diagonally, with wider apertures, and with the bottom bricks brought to the top; and after this process, which is called *skintling*, they are removed to the *clamp*

which is a vast pile of bricks laid together as closely as possible on a slightly concave foundation of brick rubbish, the raised ends of which face the north and south. On this foundation the new bricks are built up in lots or *necks*, of which the centre one, which is first erected, is vertical, while the others, owing to the concavity of the foundation, have a slight inclination towards it. Small spaces, filled with breeze, are left among the lowest courses of bricks, and flues or *live-holes*, about the width of a brick, and from 6 to 9 feet apart, are also formed to aid the lighting of the clamp, and filled with dry havins or wood. When full the clamp is surrounded by old bricks, or by the driest of those newly made, and a thick layer of breeze is spread on the top. The external bricks are coated with a thin plastering of clay; and, if the weather prove wet, the kiln is protected by *loos* or hurdles interwoven with rushes. The fire is lighted at the mouths of the flues or live-holes, which are closed when it burns well. The burning occupies a considerable time by this system, during which the cindery matter contained in the bricks is gradually consumed. Such bricks as are found to be imperfectly burned are put into the next clamp to be burned again. Those which are sufficiently burned are separated, according to quality, into—hard sound *stocks*; *place* or inferior soft red bricks; and *burns* or *clinkers*, which are black-looking masses of vitrified brick of very inferior value.

Kiln-burned bricks are, as their name implies, burned in a kiln or oven instead of a clamp, and have no ashes mixed with the clay; and in all our best conducted brickfields drying and burning in kilns has taken the place of the old clamp system. Ordinary bricks are moulded in this country 10 inches long, 5 inches wide, and 3 inches thick, and are reduced by drying and burning to about 9 inches long, 4½ inches wide, and a proportionate thickness. [See BRICK, BATH.] Fire-bricks, also called Windsor bricks, are 1½ inch thick, and of a quality to resist the action of fire.

Of late years machinery has been substituted for hand labour in many of the processes of brick making. Messrs. Clayton, Howlett, & Venables' machines are made of several kinds, to suit the nature of the clay to be treated, and are made in sizes to produce from 5000 to 30,000 bricks of ordinary plastic clay per day of ten hours. Fig. 1 in Plate represents a perspective view of one of their machines, of capacity to make 20,000 bricks per day from ordinary plastic clay. This machine combines the three processes of "crushing," "pugging," and "moulding" at one operation, and is worked by a 10 horse power steam engine. The clay is fed direct from the clay heap into the hopper by barrows or trucks; at the bottom of the hopper there works a powerful pair of crushing rolls, which are capable of being adjusted, with their peripheries any desired distance apart, according to the nature of the clay. In order to insure uniformity of feeding, and compulsory passage of the clay between these rollers, an instrument called a "cranmer" is used, consisting of a horizontal revolving shaft, provided with a number of knives or blades situated immediately above and parallel to the opening between the rolls, its function being to draw or crane in the clay between them as the rollers revolve. The crushed clay falls directly from the rolls into a horizontal pug-mill, where it is pugged or mixed to a uniform consistency by means of knives or blades fixed upon a revolving shaft. This shaft is also fitted with propellers, which at the same time force the clay forward towards the end of the pug cylinder. A die or moulding orifice is attached to the end of the cylinder, which causes the issuing stream of clay to assume a rectangular form corresponding in size to the length and breadth of a brick. The stream of moulded clay, as it passes from the die, is received upon a cutting-table, where it is divided (by means of a series of wires stretched in a frame) into lengths corresponding with the thickness of a brick. The same operation which cuts the bricks

delivers them upon a board, upon which they are removed to the drying ground. These tables, as well as the dies attached to Messrs. Clayton & Co.'s machines, are of very ingenious construction, the latter being made with revolving sides. These sides are each composed of a roller clothed with moleskin, and driven by means of gearing or driving straps from an intermediate shaft, which receives its motion direct from one of the axes of the crushing rolls. The peculiar arrangement and action of these dies produce the long-sought-for accuracy of cube form of the moulded mass of clay, and the sharpness or perfection of the angles and corners when cut into the size of bricks. As to the quality of bricks made by this machine, numerous experiments made for the commissioners of sewers most conclusively and satisfactorily establish their power to resist a crushing pressure.

Ralston's machine, illustrated on fig. 2 of Plate, is driven from the main shaft, s, upon which is a bevel pinion geared with bevel wheel attached to the lower end of the vertical or knife shaft, k. The clay is put in at the top of the cylinder of the machine, and is generally brought there by waggons up an incline from clay-holes. The waggons are worked by hoisting gear driven by the same engine that drives the machine. The clay is then gradually pugged till it gets down to the bottom of the cylinder, where the sweeps seize it, and force it into the moulds, m, m slides on each side of the machine, where it comes under a pressure of some tons from centre pistons worked by two strong levers, l. There are two moulds in each slide, and these slides are worked by connection rods attached to two large cranks, c, on end of flying frame. After one of the moulds in the slides is filled and pressed, the slide moves forward till the other moulds get into position for being filled, when the one that is already filled is punched out by side pistons, and the bricks drop on to brackets, and are lifted by a boy and placed on a long barrow, and then wheeled by men to the field, where they are taken from the barrow and dyked in rows as high as seven or eight bricks. The bricks made by the above machine are pressed and stamped with name, and the quantity which can be turned out with ease is forty per minute, or 24,000 per day of ten hours; and by a little extra pressure 30,000 can be made. These machines are principally used in Scotland, and they are also at work in America, Australia, Spain, England, and Ireland. The makers are Messrs. William Ralston & Son of Glasgow.

Some very successful experiments have recently been made with the view of utilizing the immense mounds of shale (the refuse of the coal mines) which cover an area of several thousand acres in South Staffordshire, by converting them into bricks. When properly pulverized the shale is found to be excellent material for the purpose, the bricks produced being hard and durable, resembling in colour the fire-clay bricks of the Stourbridge district. For ordinary buildings they are found to be of equal practical value to the ordinary red bricks.

For the manufacture of the ordinary building brick the principal districts are in Essex and Kent, by the sides of the Thames, Swale, and Medway; Somersetshire, in the vale of Parrot; Norfolk, near Thetford; and Bedfordshire, in the flat valley of the Ouse. Further north again, when we get into the coal country, we have the clays which are required for fire-bricks and those for glass-making.

It was formerly the practice to employ in brickfields large numbers of very young children, who were here doomed to a species of cruel and heartless slavery; and in consequence of this the Legislature passed a law in 1871 that no child should work in a brickfield under ten years of age, and no girl under sixteen. The frequent visits of factory inspectors (brickfields being included under the Factory and Workshop Act) insure strict observance of this salutary law.

At the International Exhibition of 1874 there were exhibited some varieties of brick prepared without burning. They were made by mixing certain materials of the nature of cements or mortars, and squeezing the mixture into the desired shape by hydraulic pressure. The duty on bricks, after having existed since 1784, was abolished in 1850.

BRICK-CLAY is a general name for any clay from which bricks can be made. As thus applied it includes a vast variety of admixtures, in varying proportions, of sand with silicate of alumina, containing small quantities of iron, lime, and the alkalis. The most injurious constituents are pyrites and carbonate of lime, as on heating they are decomposed, and the escaping gases are liable to distort the bricks; if the lime is in small proportions and in fine powder, on burning silicate of lime is produced, which renders the clay more easily fusible. This is an advantage, except for fire-bricks, as when the bricks are partially vitrified they are harder and more homogeneous. Iron has a somewhat similar effect; but if too much lime is present, or it be in lumps, quicklime is produced, which when the bricks are wetted slaks or becomes hydrated, and disintegrates them. A good brick-clay consists of about one part of silicate of alumina to four parts of sand or silica; if too much sand is present the brick is porous and friable, if too much alumina it is too rich, and shrinks during drying and burning, and is badly shaped. Brick-clays that contain only very small quantities of fluxing materials (iron, lime, and the alkalis) do not vitrify, and are called *fire-clays*.

Brick-clays occur in strata of almost every age that have not been much altered or metamorphosed. They are most abundant in the newer formations, but may result from the disintegration of any argillaceous rock. The purer and richer fire varieties are *porcelain-clay* and *pipe-clay*.

In geology the term *brick-clay* is sometimes applied to a clay that results from the wasting down either of boulder-clay or of a disintegrated rock.

BRICK, BATH, a light-colored brick used for cleaning purposes, manufactured from sand taken from the bed of the river Parrot, at Bridgewater.

BRICK WORK, or the art of the bricklayer, consists in the judicious arrangement or fitting together of bricks to form a wall or other mass of building, so that they may mutually support each other, and that the strength of each individual brick, as well as that of the mortar or cement by which they are united, may be applied in the most efficient manner to the strength of the whole structure. This object, which is termed *bonding*, is accomplished by breaking or distributing the joints, so that two may never come immediately over each other, and by laying some of the bricks, as *stretchers*, or stretching courses, with their length in the direction of that of the wall, and others, which are called *headers*, with their length running across, or in the direction of the breadth or thickness of the wall. The bonds in most common use are *English bond*, consisting of alternate layers or courses of headers, and stretchers; *French bond*, in which headers and stretchers are laid alternately in the same course, the headers of one course being laid across the middle of the stretchers of the course below; *quarter-wall bond*, consisting of three stretchers and one header in the same course; and *herring-bone bond*, which is sometimes used in the core of very thick walls, and is produced by laying the bricks at an angle of 45° with the direction of the wall, and reversing the inclination of each successive course. Whenever it is necessary, in order to prevent the *perpend*, or vertical joints, coming immediately over each other, a half, quarter, or three-quarter brick, or *bat*, is used to commence or finish a course. Walls, the thickness of which is 9 inches, or equal to the length of one brick, are called single-brick; those half of that thickness, half brick; and others brick and a half, two bricks, two bricks and a half, &c.

Arched and jointed work requires peculiar care, and in

many cases the cutting of the bricks to fit each to its particular bed; and in ordinary house-building great neatness is called for in the formation of the flat arches over doorways and windows; but the details of these and other peculiar departments of the bricklayer's art cannot here be entered upon. Some further information on the subject is given under **BUILDING**.

Mortar, the cement usually employed for brickwork, is composed of either gray or white lime (the gray or stone lime being preferable), and river, sea, or road sand, mixed with water in the proportion of one part of gray lime to two and a half of sand, or one of white or chalk lime to two of sand. The dipping of the bricks in water as they are laid makes them adhere more firmly to the mortar. Hydraulic lime is now extensively used, and is superior to ordinary gray or white lime.

The foundations of a wall are always laid broader than the superstructure, and the broader courses are termed *footings*, the projections themselves being called *set-offs*. Garden walls are usually strengthened with piers or buttresses projecting 4½ inches, at intervals of 10 or 12 feet. When new walls are joined on to old, it is usual to take out a brick or part of a brick from every alternate corner of the old work, in order to *tooth* in the new work; and these toothings are left in the first building when it is intended to join new work to it. In many cases, also, strips of iron hoops are laid in the horizontal joints, to afford a further bond or tie between the old and new brickwork. Brickwork is measured by the *rod* of 272 superficial feet. In Scotland it is measured by the *rod* of 36 square yards.

BRIDEWELL, a name frequently given to houses of correction. St. Bride's Well, near the Church of St. Bride, in Fleet Street, was one of the holy wells of London, and in its vicinity Edward VI. founded an hospital, which was afterwards converted into a receptacle for disorderly apprentices—in fact, into a house of correction—for which purpose it was used for many years. Houses of correction in different parts of the country came to be called Bridewells, in consequence of the hospital in Blackfriars having been the first place of confinement in which penitentiary amendment was a leading object.

BRIDGE, a construction of wood, stone, brick, or iron, or two or more of them combined, consisting of a roadway or platform supported at an elevation above the natural surface of the ground, or over a river or other piece of water, upon beams or arches, or hanging from chains resting upon piers. Parapet-walls or other fences are added to the sides of the road for safety. Bridges conveying water above the surface of the land are termed *AQUEDUCTS*; those conveying roads in the same manner are termed *VIADUCTS*. The principle of construction is in all cases the same as that of other bridges.

We are not acquainted with the earliest history of this useful contrivance; but the idea may have been taken from such natural objects as the bridge of Icononzo in South America, or the Rock Bridge in Virginia, or from the means of passage afforded by the accidental falling of trees across brooks and rivulets. The Old Testament contains no mention of bridges, and perhaps the oldest bridge historically recorded is that at Babylon. The Chinese lay claim to high antiquity in the construction of arched bridges. One at Fouchou-fou is 400 yards long, and about 12 yards wide, and had formerly shops upon it; and one at the estuary of Suen-chou-fou, is 2500 Chinese feet in length, 20 in width, and has 252 stone piers, on which is laid a roadway of huge stone blocks. Chinese bridges have pointed, semi-circular, polygonal, and semi-elliptical arches.

A simple mode of constructing arches is illustrated in the great pyramid of Gizeh. Here the Egyptians have increased the width of the building courses till they met at the top. This plan, applied to bridge-building, was that adopted by the ancient Greeks, and remains of it may be

yet seen over the Pamisos in Messenia and over the Eurotas at Sparta, &c. In each case the Greek piers have been used to support modern arches, but the difference of the masonry and age of the stone keeps them distinct. When the piers had thus been built to overhang the stream as much as was safe, the narrow chasm which yet remained was bridged across by beams, along which ran the roadway. We might say these were rather huge brackets supporting the causeway than true bridges.

The Romans executed many good specimens of bridge-building, some of which remain in use to the present time. These are of brick; but some remarkable Roman bridges, such as the Pons Sublimis at Rome, and that constructed by Caesar across the Rhine, and described in his "Commentaries," were of timber. The piles of the Sublimis bridge may yet be seen at low water near the Cloaca Maxima in the Tiber. It was the oldest of the Roman bridges, gave communication to an outwork or castle on the Janiculan Hill across the Tiber, and was erected probably by King Ancus Martius, fourth king of Rome, who built the fortress. (It was often carried away by the Tiber, and was superseded by the stone bridge of Lepidus close by, but was continually rebuilt in wood, from "piens" motives). The earliest of these timber bridges fully described is that thrown by Julius Caesar over the Rhine, and described in his "De Bello Gallico," book v. Palladio, the great Renaissance architect, worked out Cassi's plan, and suggested many such cheap and yet strong constructions. One of these he carried out over the river Cismona, not far from Trent, at the foot of the Italian Alps. This bridge is really suspended by the framing which forms its sides. Modern timber bridges will be discussed later.

Trajan's bridge over the Danube, the most stupendous work of the kind constructed by the Romans, had 20 stone piers, 60 Roman feet broad, and 150 feet, without the foundations, above the bed of the river. These piers were 170 feet apart, and were united by wooden arches. The bridge of Narni, over the Nera, forms a fine specimen of their bridge architecture, entirely in brick; and the Pont du Gard, near Nîmes, is a remarkable example of their bridge aqueducts. (See Plate III.) The latter consists at the base of a series of six arches, forming a bridge 165 feet long. This is surmounted by a longer series of arches, extending 780 feet, to the slope of the mountains on each side; and above these is a third series, of thirty-five smaller arches, extending to the length of 850 feet, on the top of which is the aqueduct or channel for water. The entire height is 190 feet. Another ancient Roman bridge, crossing the Tagus at Alcantara, consisted of six arches elevated 200 feet above the river. Its total length was 670 feet, and breadth 28 feet. Engravings of other famous Roman bridges are given in our Plates. Plate I, fig. 3 contains Durand's restoration of the *Pons Triumphalis* of ancient Rome. It was called *Triumphalis* because the Triumphs of the later emperors passed along it in the procession. The remains of its piers are visible at low water at the back of the Hospital San Spirito. It led from the Campus Martius to the Vatican Hill, close to the Pons Ælius, which still gives access to the Vatican and St. Peter's under the name of Ponte S. Angelo. Fig. 2 shows the restoration of the *Pons Senatorius* or *Pons Palatinus*, by the same artist. It received the name *Senatorius* from the circumstance that the senators passed in procession across it on their way to the Janiculan Hill, when they went to consult the Sibylline books. The Pons Senatorius was carried away, in great part, during an inundation of the Tiber. The remainder is called the "broken bridge," *Ponte Rotto*. It stood so for centuries before it struck the city authorities to make any use of the fragment. It is now completed by a short suspension bridge extending from the last pier to the left bank. As an example of the excellent workmanship of the ancients, the architect Tomanza says that all the

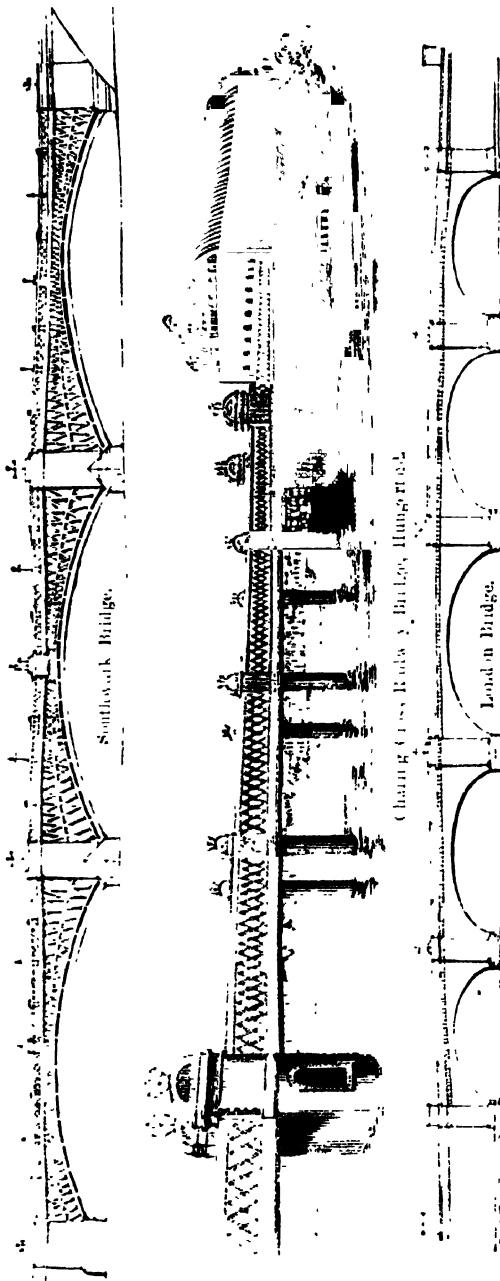
voussoirs and other masonry of the bridge of Augustus at Rimini (shown in Plate I, fig. 1, restored) have their beds so finely jointed that a hair could not pass between. The bridges erected in this finished style by the Romans in the provinces under their sway afforded models from which the art of constructing bridges extended throughout the north and west of Europe. No country possesses finer or more numerous examples than our own.

The oldest bridge now existing in England is the triangular bridge at Croyland, Lincolnshire, which is said to have been erected about 860. It consists of three cast-iron arches, whose bases stand equidistant from each other, so that the circumference of a circle, and which unite at the top. What motive can have led to the construction of so singular an edifice it is difficult to conjecture. The celebrated Old London Bridge was begun by Peter de Colechurch in 1176. He was a priest, and is believed to have been a member of an international bridge-building fraternity, of whom scanty records survive. Their object was to construct

to secure passages by bridge or ferry, against the lawless marauders of the time, for merchants and peaceful travellers. There is some trace of their work in the south of France, and the well known Bridge of Bonazel (now a ruin) over the Rhone at Avignon was begun by this society in the very same year (1176) is Old London Bridge. This latter had originally twenty-two arches, and was encumbered with a street of houses, as are yet the Rialto at Venice and the Ponte Vecchio at Florence. The houses of Old London Bridge were removed in 1756, and the three centre arches converted into one of 72 feet span. Among the more remarkable bridges, not of very modern date, in this country is that of Breston-on-Trent, 1475 feet in length, and having thirty-four arches. Other railway bridges became common; this was said to be the longest in England. The Pont y Ffadd, over the Telforden Estuary, in Glamorganshire, completed in 1755, is a fine work, consisting of a single arch, 110 feet span and 35 feet high, forming a segment of a circle of 175 feet diameter. It is shown in Plate II, where it may be compared with the celebrated Rialto at Venice. (The third illustration on the same Plate is a fine single-arched iron bridge by Rennie across the Witham at Bosten in Lincolnshire.)

The modern bridges across the Thames form noble specimens of bridge architecture and engineering. The annexed woodcuts represent three of them, two of which were erected from the designs of John Rennie, who also erected Waterloo Bridge. The actual construction of London Bridge, his masterpiece, was intrusted to his son, Sir John Rennie, for the great architect died as the works began. This noble structure is of granite, 928 feet long between the abutments, and consists of five semi-elliptical arches, of which the centre one has a span of 152 feet, while the next pair and the abutment arches are 110 and 160 feet respectively. It was commenced in 1824 close by the side of the old bridge, the approach to which is marked by Fish Street Hill and the Monument, and completed in 1831, when the old bridge was removed. Southwark Bridge is 718 feet between the abutments, and consists of three cast-iron arches, each forming a segment of a very large circle, the span of the centre one being 250 feet, and of the others 210 feet each. They are supported by granite piers. Waterloo Bridge is a fine example of a flat or level bridge, with a horizontal roadway supported by a series of arches of equal elevation. It is of granite, has nine elliptical arches of 120 feet span, and is approached by elevated roads, supported upon brick arches. The length between the abutments is 1380 feet, the river being wider at the point than it is lower down; but, including the inclined approaches, the total length is 2456 feet. The cost was upwards of £1,000,000. It was noticed as a specimen of Rennie's care in building, that Waterloo Bridge sank only 3 inches when the centres were removed, while the Pont

de Neuilly at Paris, by the celebrated Perronet, sank no less than 23 inches. Some very fine specimens of equal-arched bridges have been erected by French engineers, of which one of the handsomest is the above-mentioned Pont de



Neuilly, built by M. Perronet between 1768-80 over the Seine, with four arches of 128 feet span.

The iron bridge at Westminster, built by Mr. Page, is unquestionably the finest and most handsome structure of the kind in the metropolis. It was commenced in 1858, and opened on 24th May, 1862. The arches, seven in number, each formed of seven ribs, are of cast-iron nearly

up to the crown; where, to avoid the danger of concussion from heavy loads, they are of wrought metal. They vary in span, from the smallest of 96 feet, to the largest, in the centre, of 120 feet, and from a height of from 16 to 20 feet above high water. It is 1160 feet in length and 83 feet in width, and cost about £4 per square foot.

The Charing Cross Railway Bridge was the first and is still the longest structure of the kind which spans the Thames. (See woodcuts.) It is built of iron, resting on the brick piers of an older suspension bridge. (The latter now spans the Avon at Clifton, near Bristol.) The total length is 1360 feet; the width between the main girders, 50 feet; but on each side there is also a pathway of 7 feet for foot passengers, with a clear headway of 25 feet above high-water mark. About one-third of the bridge is occupied by the station, which, commencing at the north pier, deviates from the width maintained up to that point, and gradually spreads out. There are two arrival and two departure platforms. The interior of the station is 450 feet long, 170 wide, and 100 high; and considering the formidable obstacles which had to be overcome, it presents a wonderful instance of ingenuity and skill. The still wider and more recent Cannon Street Bridge is supported by massive iron cylinder piers, and has five girder spans of iron, three of 167 feet, and the two outer ones of 135 feet each. It carries the South-eastern Railway into the heart of the city. The Alexandra Iron Railway Bridge at Blackfriars carries across the far less important city traffic of the London, Chatham, and Dover Railway.

The merit of first employing iron in bridge-building, though apparently due to England, may be disputed by China. The first iron bridge ever built in England was cast at the Coalbrookdale Foundry in 1777, and still spans the Severn, by a single arch of about 100 feet span, about 2 miles lower down its course. The second is noteworthy as having been designed by Thomas Paine, often called Tom Paine, whose religious and political tenets, which would now hardly attract unusual notice, were in his day considered atheistical and revolutionary. Paine's bridge (1796) was firm and stable, whatever were his principles, and it stands yet across the river Wear at Bishop's Wearmouth in Durham. It consists of an arch of 236 feet span, with a clear height from low water of 60 feet to the spring, and 91 feet to the centre of the arch, so that ships of 300 tons pass under it by lowering their top-gallant masts. Telford and Rennie adopted the material, and the Southwark Bridge (at first called the Trafalgar Bridge) of the latter was cast by the same founders at Rotherham who produced Paine's bridge. The important principles involved in the construction of iron suspension bridges will be treated separately under that heading. Swing bridges, and other contrivances for removing the roadway when it is necessary to allow a passage for masted vessels, constitute another class of iron bridges on which much ingenuity has been expended. In many cases such a bridge consists of two parts, which when closed meet in the centre, and are either raised or turned aside out of the way when the waterway has to be opened. By the use of counterpoises to balance the weight of the parts thus moved, and of suitable machinery, bridges of considerable size, and of many tons weight, may be opened and closed in a few minutes by one or two men. Another curious contrivance for a similar purpose is the *telescope bridge*, introduced by Mr. Ristrick on the South Coast Railway, in which a massive platform, more than twice as long as the waterway is broad, is so mounted on wheels as to be capable of having one-half either projected across the river Avon, or drawn back out of the way; an adjoining portion of the railway being laid on another movable platform, which may be rolled to one side to make way for the larger platform when it is thus pushed back from the river.

Timber bridges, which are in many cases advantageous

from their cheapness, are frequently preferred by modern engineers for their peculiar fitness in cases where an imperfect foundation, or some other circumstance, renders bridges of stone, brick, or iron unsuitable; while the introduction of various methods for preserving wood from decay obviates one of the principal objections to them. By the due application of trussing timber bridges of extraordinary span may be constructed with safety. In Plate III. fig 2 is shown the bridge across the Gismone by the celebrated architect Palladio, already referred to. Germany is the great country for timber bridges, and there are many excellent structures of the kind in Switzerland. Some such are called *pendent bridges*, and many examples of this kind of structure are found in America. The Upper and Lower Schuylkill Bridges, near Philadelphia, and that across the Delaware at Trenton, are among the most remarkable. The Upper Schuylkill Bridge, which is also called the Colossus, consists of one very flat arch of 310 feet span. The Lower Schuylkill Bridge has three arches, one of 195 and the others of 150 feet span, resting on stone piers. The Trenton Bridge has five arches, one 200, two of 180, and two of 160 feet span, resting upon light stone piers.

More akin in principle to trussed timber bridges than to cast-iron arched bridges are the Britannia and Conway wrought-iron tubular bridges, or bridge-tunnels, of Mr. Robert Stephenson, for carrying the Chester and Holyhead Railway across the Dee and the Menai Strait respectively. In these structures the railway passes through the interior of a hollow girder formed of sheet iron of a rectangular section, and strengthened above and below by small rectangular tubes. The Conway Tubular Bridge has a span of 400 feet. The Britannia Tubular Bridge consists of two tubes of iron placed side by side, through which the up and down trains respectively pass. The entire length of each tube is 1513 feet, and the height above high water 102 feet. Each length of tube consists of four separate pieces, the ends of which rest on a central pier built on the Britannia Rock in the middle of the Menai Strait, two towers on the shores of Anglesea and Carnarvonshire respectively, and two abutments further inland on each coast. The clear length of each part reaching from the side towers to the central tower is 460 feet, so that the entire length of the tube across the strait is 920 feet, leaving 593 feet for the two outer spans. The weight of the whole structure is 10,540 tons, and its cost amounted to £601,865. In its turn the Britannia Bridge has been surpassed by the gigantic structure called the Victoria Bridge over the St. Lawrence, near Montreal, the total length of the tube of which, divided into twenty-four spans, is nearly 2 miles. The total surface of iron used in this bridge was 32 acres, and the cubic feet of masonry in the piers is reckoned by millions (2,750,000). The cost of the Victoria Bridge was £1,400,000. Solid tubular bridges are no longer used. Such bridges are now made in lattice work, not in solid plates, and every beam is placed at the angle of strain, so that no power is lost.

A peculiar construction was invented by L. K. Brunel for the Royal Albert Bridge at Saltash, near Plymouth, opened in 1859. It unites the counties of Devon and Cornwall, by conveying the Cornwall Railway across the river Tamar. Its total length is nearly half a mile, over which it conveys a single line of rails by nineteen spans. The two central leaps of roadway overhang the water 910 feet. They meet in the centre on a pier formed of four cast iron columns, and the great weight and lateral thrust are sustained by two segments of a huge circle of wrought-iron tubing, forming arches rising into the air high above the passing train. From the ends of these flat massive chains are hung, so as to form an opposite segment of a similar curve. The space inclosed is an oval pointed at both ends, exactly the shape of a willow leaf. The roadway is hung from these immense bows. The rest of the viaduct is sustained

by hollow beams of boiler plate or flat wrought iron, resting on stone piers. The great main pier on which the bridge chiefly impends is 210 feet high from its foundation in the bed of the river, and the tubes are 170 feet in height from the surface of the water.

The Tay Bridge, opened 1st June, 1878, and carrying the North British Railway over the Frith of Tay at Dundee, was at the time of its construction the largest iron bridge in the world. Its total length from shore to shore was 10,320 feet—or very nearly 2 miles—and it comprised eighty-five spans, varying in length from 67 to 215 feet. Its total cost was £350,000. It had a melancholy fate, the whole central portion, with the piers on which it rested, being blown down by a very violent gale on Sunday night, 28th December, 1879, leaving half a mile's gap in the bridge. A train passing at the time was hurled into the river, twisted among the lattice-work of the girders, and all its occupants perished. A scheme has since been sanctioned by Parliament for building a new bridge alongside the remains of the ruined structure.

The largest bridge yet built on the suspension principle is that between New York and Brooklyn (Plate III. fig 3), crossing the arm of the sea known as East River. It was commenced in 1861, and only completed in 1883. The engineer was Colonel A. W. Robbling, who however died during its construction, and the work was completed under the supervision of his son. The total length is 5089 feet, consisting of three spans—two of 930 feet each, and one, the centre span, of 1595½ feet. The two suspension towers are 278 feet in height, and the bridge itself is 135 feet above high-water level. There are four cables, each nearly 115 square inches in section, and together containing 6,928,316 lbs. of wire, with an estimated strength of about 14,000 tons. The aggregate weight of the bridge and its moving load is estimated at 34,000 tons. It is divided into five avenues, the outer two, each 19 feet wide, being for vehicles, and the central elevated road, 15½ feet wide, for foot passengers. The other two roadways are for the surface cars, which are moved across by an endless chain. It was opened with great ceremony on 12th May, 1883. Shortly afterwards this bridge was the scene of a lamentable loss of life, due to a panic which took place among the foot passengers when it was in a crowded state. The cost of the structure was upwards of £5,000,000.

The great railway bridge over the Forth, begun in 1883, which places England and the southern part of Scotland in much nearer communication with Fife, Perthshire, Aberdeenshire, and the eastern Scottish Highlands, is from a design by Mr. John Fowler, C.E., and Mr. B. Baker, C.E. Sir Thomas Bouch had prepared a design for the Forth Bridge, the main feature of which was a suspension bridge, or rather a combination of two double suspension bridges, hung on piers carried to the extraordinary height of 596 feet in the middle and of 584 feet at the ends. It was deemed necessary to adopt this principle, on account of the extraordinary length of span required by the unusual breadth of deep water that has to be traversed. On each side of the island of Inchgarvie there is a deep valley in the river-bed some 1600 feet broad. The depth on the north side is 210 feet, and that on the south side is 180 feet below the water level. These broad and deep depressions in the river bed, which must be crossed at a single span, constitute the great engineering difficulty of the undertaking. In other respects the conditions are less exacting than those in the case of the Tay. The breadth of the river is less, and over the rest of the channel the depth of water is only 30 feet, and very secure and workable foundations can be obtained. Messrs. Fowler and Baker departed from Bouch's plan, and cross the deep valleys by two huge steel girder bridges of 1700 feet span. There are two adjacent spans, each 675 feet, on the return sides of the girders to the nearest piers; and between the piers,

in comparatively shallow water, there are eighteen openings of 150 feet each. The whole length of the bridge is a mile and a half. The under side of the girders is arched. Their height is no less than 340 feet at the piers, and gradually diminishes towards the centre, where it is about 50 feet. This minimum of 50 feet will be continued for about 500 feet in length, so that there will be a clear headway of 150 feet above high-water level for that space in the centre of each opening. Another striking peculiarity of the design is that the sides of the bridges are not perpendicular throughout, but incline inwards at a considerable angle for some distance from each pier. At the piers the two main girders are 120 feet apart at the bottom, and only 50 feet apart at the top. This form has been adopted in order to enable the structure the better to resist the pressure of the wind. The adoption of steel instead of iron as the material of construction adds greatly to the strength of the bridge, while diminishing its weight. The amount of steel to be used in the structure is estimated at 50,000 tons; and the cost of the whole work, including the connecting lines or railways, will be £1,600,000. It will be four times the size of any bridge ever yet built. The bridge is not to be the work of the North British Railway only. Three great English companies—the North-eastern, the Great Northern, and the Midland—have an interest in the stupendous undertaking, and the consulting engineers of these companies approved the design, which is given in Plate IV.

A brick or stone bridge must have the following parts:—an abutment at each end, a roadway resting on a flat and passive or on arches, piers to support the arches, and the arches, and a parapet to protect the roadway. All else is ornament that is essential. The securing of a good foundation for the piers is the point of primary importance in bridge-building. Where the ground is soft this must be done by *piling*, or driving whole trunks of timber pointed and shod with iron to great depth, in order to exclude the water, and laying the foundations of construction thereon; or the masonry of the piers is sunk to form in the bed of the river a *coffer-dam*, or water-tight inclosure of piling, from the interior of which the water is pumped out. To save the enormous expense of this plan *caissons* were invented. One of these being floated to the spot where a pier is to be founded, a few courses of masonry are built within it, and it is sunk into the required position. The vertical sides are subsequently removed, leaving the pier bottom resting on the masonry as a kind of floor or foundation.

The arches of a bridge are built upon wooden frames or centres, of the exact shape of the arch, convex as the arch is concave. It is evident that the stability of the arch depends on the centre, for it is of wood, and design the arch will fall on the day the wood supporting the centre is removed; and if the centre is not strong enough to bear the arch during construction it will be crushed out of shape or may fall altogether. Plate V. therefore gives a few examples of centres. Fig. 1, by Smeaton, is certainly an almost perfect example, the architect (to mention one word) having contrived not so much to do with the best quantity of timber as to cut it with the least waste. The arch, such as shown in fig. 1, formed the centre of fig. 2, by Telford, follows Smeaton's manner. Another, but contrast, very flattering to our insular pride, is shown in figs. 3 and 4. The first is Perronet's centre for the Neuilly Bridge (which sunk 23 inches, as already mentioned, when the centre was removed), and the second is the celebrated Rendel's centre for Waterloo Bridge (which sunk 3 inches only). But fig. 4 is very expensive, and is the only one, though not practically, because a heavy load at a small mark as the centre, of course, has to bear while the arch is yet unfinished and the central part is not built, will certainly cause the arch to rise at C, the crown. This was counteracted by C being

heavily weighted before the arch was begun—a clumsy way of neutralizing a fault in design, for the centre must still undergo slight change of form during the building, and the stability of the arch is thereby lessened. Tredgold's centre, fig. 5, is given as a solution of this difficulty. For if $L, E, F, F',$ and E', E' be each trussed, and if E, F and E', F' abut against F, F' at the points F and F' , it is obvious that equal loads at D, D' will not raise F, F' , if only the latter is strong enough to resist pressure in the direction of its length, a condition easy to secure. Elmes' fine design for a centre of London Bridge, fig. 6, combines Smeaton's economy of timber with the other requisites—the excellent method of lowering the centre when it is done with, by turning out the screw wedges, when it sinks by its own weight, is shown in fig. 7. This invention also is due to English bridge-builders.

Various matters peculiar to railway bridges are given under RAILWAY AND SKIRM BRIDGES; those which are employed for military purposes are described under BRIDGE MILITARY. Bridges of boats are available in some situations as substitutes for ordinary bridges. In some cases they consist of a platform laid upon a series of boats or barges, which may be regarded as so many floating piers. In other cases, where there is a rapid current, *guying bridge* or *pontons volants* are used, consisting of a few boats attached to a cable, or a barge firmly moored in the centre of the stream, and moved from side to side as required. This movement is generally effected by turning the boats themselves at such an angle to the current of the stream that by its force they are conveyed to the other side.

A more perfect contrivance than the last-mentioned is the *floating bridge*, contrived by the late Mr. Rendel in lieu of an ordinary steam ferry-boat, for which the current was found to be too strong, as a means of communication between Torpoint and the Cornwall shore, at the mouth of Plymouth harbour, and which has since been applied also to the harbours of Dartmouth, Portsmouth, and Southampton. It consists of a large flat-bottomed vessel, the deck of which is adapted to receive horses and carriages as well as foot passengers, and which is propelled by means of wheels turned by a steam engine mounted in the vessel.

LAWS RELATIVE TO BRIDGES. Bridges are of two classes, public and private. Public bridges may be considered either as county bridges or as highways. Every county bridge is a highway, inasmuch as it is a bridge over which a highway passes; so also is every other public bridge over which a highway passes. The usual distinction drawn between them is derived from the nature of the space over which the bridge gives a passage. A county bridge, or, in other words, a bridge which the county is bound to repair, is usually defined to be "a common and public building over a river or water flowing in a channel more or less definite, whether such river or channel is occasionally dry or not." A county bridge may be either a foot, horse, or carriage bridge. A private bridge is any bridge which does not answer the description of a county bridge or a public highway.

By the common law the burden of repairing county bridges is thrown on the whole county; that of highways on the inhabitants of the parish wherein such highways lie. *Prima facie*, therefore, the county is liable to repair a county bridge; but they may rebut this liability by showing that the burden has been shifted from them. They may either show that a hundred, or a parish, or some other known portion of a county is by custom chargeable with the repair of a bridge erected within it; or that some person is liable to that expense. In the case of private individuals such liability may depend either on tenure—that is, by reason that they and those whose estate they have in the lands or tenements are liable in respect thereof—or on prescription; in the case of corporate bodies, on prescription only. Any bridge answering the definition of

a county bridge may become a charge on the county, though not originally built by the county; for instance, if it be built by the crown or by a private individual; but not every bridge which answers the definition is therefore chargeable to the county for repair, unless it be also used by and useful to the public. The public use and benefit seems to be the criterion; and if a private individual build a bridge, which is principally for his own benefit and only collaterally of benefit to others, he will be liable to the repair; but where the public derive the principal benefit they must sustain the burden of repairing it. The county is liable for the repair of a public bridge erected by commissioners under an Act of Parliament, even though the latter are empowered to raise tolls to support it, or though other funds are provided for the repairs, unless there be a special provision for exonerating it from the common-law liability, or transferring it to others. Even if the bridge has been erected and constantly repaired by trustees under an Act of Parliament, and although there are funds for the repairs, the county is still liable to repair it. If trustees under a Turnpike Act build a bridge across a stream, where a culvert would have been sufficient but a bridge was better for the public, it has been held that the county could not refuse to repair such bridge on the ground that it was not absolutely necessary.

The 5 & 6 Will. IV. c. 50, s. 21 (the General Highway Act), with respect to the bridges built after the 20th of March, 1836, enacted "that if any bridge shall hereafter be built, which bridge shall be liable by law to be repaired by and at the expense of any county or part of any county, then and in such case all highways leading to, passing over, and next adjoining to such bridge shall be from time to time repaired by the parish, person, or body politic or corporate, or trustees of a turnpike road, who were by law, before the erection of the said bridge, bound to repair the said highways: provided, nevertheless, that nothing herein contained shall extend to exonerate any county or part of any county from repairing the walls, banks, or fence of the raised causeways and raised approaches to any such bridge or the land arches thereto."

In Scotland each county has a statutory assessment for the support of bridges. See *Burclay* on "Highways."

BRIDGE, MILITARY, a temporary structure erected or put together by military engineers to enable troops, artillery, guns, and stores to cross such rivers as may be encountered on a march. Broad flat bottomed boats, called pontoons, are generally kept among military stores for this purpose, and these, when they can be obtained, form the strongest of the bridges of this class. In the hasty movements of an army, however, these are not always at hand, and the skill of the engineers is displayed in the ready use of such materials as can be obtained without undue delay. Thus bridges are made by means of trusses of timber, cables and heavy stones being used to give them solidity. Others are made by resting timbers and planking upon supports made up of floating barrels, of such boats as can be obtained near the spot, or upon stout cables made fast on each side of a stream, and supported by boats placed at intervals throughout their length. Sometimes a line of boats is fastened to the shore by one end, the other being moored in mid-stream, and when these are filled with troops, &c., the shore end is loosed and caused to swing round so as to reach the other side. This is called a swing flying-bridge. Portable boats, and air filled pontoons made of waterproof materials, have also been introduced for the formation of military bridges, but up to the present with no great success.

BRIDGE OF ALLAN. See *ALLAN, BRIDGE OF.*

BRIDGE-HEAD, or *Tête de Pont*, is a fortification covering that extremity of a bridge which is nearest to the enemy's position.

BRIDGENORTH, a town in the county of Salop, on

the Severn, 22 miles S.E. of Shrewsbury, and 150 from London by the Great Western Railway, consists of a high and a low town, on opposite banks of the river. The former is built on the steep acclivity of a rocky hill, the streets up which are formed by flights of steps. The ancient castle stands on the summit of the hill. It has a carpet and tobacco pipe manufactory, and a trade in corn, malt, &c. It ceased to return a member to the House of Commons after the Redistribution Act of 1885. The parts of the town on either side of the Severn are joined by a handsome stone bridge of six arches. The appearance of the upper town is said to be like that of Jerusalem. Where the carpet factory now is stood a religious house belonging to the order of St. Francis, and near the town was an ancient priory, attached to which the Earl of Essex founded an hospital for lepers and disabled soldiers about the time of Edward II. During the civil war the Royalist governor set the town on fire, as he could no longer hold out against the Parliamentary forces. An ancient hermitage, built by Ethelward, a Saxon prince, remains in what was formerly the forest of Morfe. *Briges* was the ancient name of the borough, and the walls, in which were six gates, were built by the Earl of Shrewsbury in the reign of William II. Bishop Percy, born in 1728, author of "*Reliques of Ancient English Poetry*," was a native of the town. Bridgenorth municipal government consists of a mayor, four aldermen, including the mayor, and twelve councillors. The population in 1881 was 7216.

BRIDGEPORT, a seaport town in the state of Connecticut, United States, 58 miles N.E. of New York. It has a port on Long Island Sound, with 15 feet of water in the bar at high tide, and a railway and steamer communication with New York. The town stands on a terrace 10 to 12 feet above high water mark, and 1 mile to 1½ mile inland. A second terrace rises to the height of 50 feet, on the many elegant private residences are placed, commanding fine views of the city and sound. It has manufactures of carriages and machinery. The population in 1880 was 27,613.

BRIDGET or BRIDE, ST., one of the patron saints of Ireland, who flourished during the latter part of the fifth and the beginning of the sixth centuries. She became a nun at an early age, and afterwards founded a monastery, which, from having been erected near a tree, oak tree, received the name of Kile Dona, or Church of the Oak, and became the origin of the town of Kildare. She was renowned during her lifetime for piety and wisdom, and the establishments of the order of Bridgite nuns were celebrated in that country for several centuries. Her memory has ever been held in veneration in Ireland and Scotland, and numerous churches have been dedicated to her.

BRIDGET, ST., OF SWEDEN (otherwise called *Birgitta* or *Birgitta*), was born about the year 1302. At the age of sixteen she was married to Ulfho, prince of Nerica, by whom she had eight children. Both husband and wife were zealous in the performance of works of charity and devotion, and after the birth of their daughter Catherine (who became St. Catherine, one of the patron saints of Sweden) they resolved to adopt, for the remainder of their lives, the monastic rule of continence. About the year 1343 they went on a pilgrimage to the tomb of St. James, at Compostella, and soon after their return Ulfho died. Bridget divided her husband's estates among her children, and devoted herself for the rest of her life to labours connected with religion. She founded the female monastery of Waster, under the rule of St. Augustine, with certain peculiar constitutions devised by herself. The nuns were called Brigittines, or nuns of the order of St. Salvator, and they had many establishments in Sweden up to the time of the Reformation. There are a few still existing in the Roman Catholic countries of Europe. She afterwards went to Rome, where she established a house

for Swedish pilgrims, and obtained papal confirmation for her rule. Subsequently she went on a pilgrimage to the Holy Land, returning to Rome, where she died on the 23rd of July, 1373. She was canonized by Boniface IX. in 1391, during the time of the great schism in the papacy, and this act was afterwards confirmed at the Council of Constance in 1415. Her writings consist of her rule, her revelations, a treatise on the "Excellencies of the Blessed Virgin," and several prayers, which are still retained in some of the Roman Catholic manuals of devotion.

BRIDGE TOWN, a city of the West Indies, the capital of the island of Barbadoes, is on the west coast of the island, built along the north shore of Carlisle Bay, and has a beautiful appearance from the sea. It is well built, in the light West Indian style, and surrounded by plantations, among which are many handsome villas. St. Michael's Church is the cathedral. It has a gaol and council-house, and a little out of the town are barracks and an arsenal.

BRIDGE WATER, a seaport and municipal borough in Somersetshire, is situated on the banks of the river Parret, 29 miles S.W. from Bristol, 17 W.S.W. from Wells, and 151 from London by the Great Western Railway. Bridgewater is mentioned in Domesday Book under the name of Brugic. The present name is a corruption of Bridge of Walter, to whom the town was given by the Conqueror. The Hospital of St. John, which had large possessions, and was confirmed by the Bishop of Bath in 1219, was suppressed by Henry VIII. There was also a priory of gray friars, and a hospital for lepers. In the civil wars of Charles I. Bridgewater adhered to the king's party. The castle was strongly fortified, having forty large guns mounted on the walls, and a moat of unusual depth and 30 feet wide, which every tide filled with water. Colonel Wyndham, the governor, defended it a long time; but at last, on 22nd July, 1645, he was compelled to surrender. The castle was completely dismantled, and the only remains of it are the Sally port and some small detached portions of the walls. The ill-fated Duke of Monmouth was proclaimed king at Bridgewater previously to his defeat and capture at the battle of Sedgemoor. The famous Admiral Blake, one of the greatest of the naval heroes of England, was a native of this town, having been born here in 1599. There is an amusing entry in the church records, that when Whitfield came to Bridgewater to preach, "one of the fire-engines was got out and he was pumped upon, the vicar assisting."

The town is pleasantly situated about 9 miles from the sea, in a level but well wooded country. The river Parret, over which there is a handsome iron bridge, divides the town into two parts, of which the western is the principal. The streets are spacious, clean, and well paved, and the houses are generally good, some of brick, and others of a durable carboniferous limestone found in the quarries of the neighbourhood. The other part of the town, called East-gate, is little more than a suburb, and the houses are not so good. The chief public buildings are the Town hall, a very fine building in the Venetian style, erected in 1805, and containing a room which will accommodate 1600 persons, the work-house, infirmary, union, parish church of St. Mary, which has a spire 174 feet in height; and places of worship for Baptists, Methodists, Quakers, Congregationalists, Unitarians, and others. There is a small grammar school, founded in 1561, another endowed school, and two libraries and reading rooms.

The elective franchise was conferred on Bridgewater by Edward I. from which time it continued to return two members till 1868. A commission of inquiry having found, however, that bribery had been gone on, he's carried on at all elections in the town from 1832 to 1868, an Act was passed in the year 1870 by which the borough was totally disfranchised.

The river Parret is navigable as far as Bridgewater for

vessels of 200 tons, but it is subject, like some other rivers in the Bristol Channel, to a rise of nearly 6 fathoms at spring tides. The flow of the tide is preceded by a head-water commonly termed the bore, which often produces much inconvenience among the shipping. The principal imports are coals, twine, hemp, tallow, and timber. Coals are imported from Wales, and conveyed into the interior of the country by means of the railway. Bridgewater has a large coasting trade, the exports consisting chiefly of tiles, ordinary bricks, and Bath (or scouring) bricks, which are manufactured in the town in large quantities from the sand and slime of the river. The number of vessels registered as belonging to the port in 1885 was 140 (9000 tons). The entries and clearances each average 4000 (250,000 tons).

The municipal borough is divided into two wards, and is governed by a mayor, four aldermen, and sixteen councillors. The population in 1881 was 12,024. The town is on the line of the Great Western Railway between Bristol and Exeter.

BRIDGE WATER, FRANCIS EGERTON, DUKE OF, founder of the English canal system, was the youngest son of Seroop, fourth earl and first duke of Bridgewater. He was born in 1736, and succeeded his brother, the second duke, in 1718. One of the estates which he inherited, situated at Worsley, near Manchester, contained a rich bed of coal, but it was comparatively of little value, in consequence of the heavy expense of land carriage and the inadequate means of communication afforded by the Irwell; and this led him to conceive the plan of a navigable canal, for which in 1758-59 he obtained an Act of Parliament. From this circumstance he is frequently styled the father of British inland navigation. He chose Brindley for his engineer, and on his plans, and under his superintendence, the work was completed in spite of many difficulties. Duke though he was, the vast expense of such an undertaking absorbed his entire revenue, and he lived almost meanly, perforce, during the prosecution of his idea. His heirs reaped a rich harvest from the self-denial and persistent courage, almost amounting to a sort of heroism, in their extraordinary relative.

The length of the main line of the famous Bridgewater Canal is above 27 miles, all on the same level, which has rendered great embankments necessary, as the canal crosses several depressions. One of these embankments is 900 yards long, 17 feet high, and 112 feet wide at the base. The main line from Manchester is in a direction a little to the south-west for about 2½ miles; it then sends off a branch in a north-west direction, which crosses the Irwell at Barton by an aqueduct 39 feet above the surface of the Irwell, and 200 yards long, and runs to Worsley, thence to Leigh and Wigan, where it joins the Leeds and Liverpool Canal. The main line crosses the Mersey to the Cheshire bank, and enters the tideway of the Mersey at Runcorn by ten locks, which have a fall at low water of 82½ feet. With the exception of that part between Worsley and Leigh, every part of the canal was executed, under the direction of Brindley, in about five years. The aqueduct at Barton was opened on 17th July, 1761, and soon afterwards the whole line. [See BRINDLEY.] He aided in many other canal schemes, and especially in the Grand Trunk system, using in this and other useful ways the command of the huge resources his earlier privations now procured him. The Duke of Bridgewater died on 8th March, 1803. He never married, and the title died with him.

BRIDGE WATER TREATISES, a series of works which were published in accordance with the last will of the Right Honourable and Reverend Francis Henry, earl of Bridgewater, who died in 1829. The will directed certain trustees to invest in the public funds £8000, which sum was to be at the disposal of the president of the Royal Society of London, to be paid to the person or persons

nominated by him. The testator further directed that the person or persons selected by the said president should be appointed to write, print, and publish 1000 copies of a work "on the power, wisdom, and goodness of God, as manifested in the creation."

The then president of the Royal Society, Davies Gilbert, appointed eight gentlemen to write separate treatises on the different branches of the subject. These have been published, and are as follows:—

1. By the Rev. Thomas Chalmers, D.D.: "The Adaptation of External Nature to the Moral and Intellectual Constitution of Man." 2. By John Kidd, M.D.: "The Adaptation of External Nature to the Physical Condition of Man." 3. By the Rev. William Whewell: "Astronomy and General Physics considered with reference to Natural Theology." 4. By Sir Charles Bell: "The Hand, its Mechanism and Vital Endowments, as evincing Design"—a very celebrated work. 5. By Peter Mark Roget, M.D.: "Animal and Vegetable Physiology considered with reference to Natural Theology." 6. By the Rev. Dr. Buckland: "On Geology and Mineralogy." 7. By the Rev. William Kirby: "On the History, Habits, and Instincts of Animals." 8. By William Prout, M.D.: "Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology." So valuable and judicious a bequest was hardly to be expected of Bridgewater, who was one of the singularities of his time. He was born in 1756, educated at Eton and All Souls', Oxford, and became a prebendary of Durham, of which see his father was the bishop. He succeeded to the earldom on the death of his brother in 1823, but continued to reside in Paris, where he had formed a sort of menagerie of dogs and cats. He had fifteen dogs, many of them frequently dressed in human clothes and dining at his table. Sometimes a fine carriage, containing half a dozen of them, was seen in the streets of Paris, drawn by four horses and attended by two footmen. He produced several Greek translations and a few English treatises, one on the great Duke of Bridgewater, subject of the preceding article.

BRIDLINGTON or **BURLINGTON** (formerly called *Brillinton*), a market-town and municipal borough in the East Riding of Yorkshire, 40 miles N.E. from York and 204 from London, with a station on the North-eastern Railway, is situated about a mile from the sea-shore and 6 miles from Flamborough Head. On the coast has sprung up of late years a popular watering place, Bridlington Quay, whose fine level sands afford great facilities for sea-bathing. The harbour is formed by two massive piers; the southern one was built in 1819 at an outlay of £10,000. The Victoria Public Rooms, close at hand, cost £8000. About half a mile N.W. rises a chalybeate spring similar in properties to that of Scarborough, but less powerful. The bay commands some noble marine prospects, and affords the best anchorage on the coast. The old town grew up about an Augustinian priory founded early in the reign of Henry I., which became one of the richest religious houses in the county, and whose annual income at the dissolution was estimated at £682. Peter of Langtoft, one of our early English chroniclers, was a canon here. Its last prior, being convicted of high treason, was executed in 1537. Owing to the necessity of being defended against attack, the canons were allowed to erect certain defences, and one of these remains in the Bayle Gate, which is now the Town-hall. In the upper room the prior carried on his temporal business, whilst the rooms below served as prisons. The ruins are considerable, and the nave of the priory church is now used as the parish church of Bridlington. The minster at Beverley much resembles this church in general style. Like most sea-side churchyards, the records of storms and wrecks are frequent; but it is not often that a single obelisk, as here, covers the bodies of forty-six sailors from twenty-three ships, who all

perished in one gale in 1871. Robert Boyle derived the title of Earl of Burlington from this town, whence the name of Burlington House in London. A Roman station is supposed to have existed here. Bridlington was the scene of many contests between the Saxons and the Danes, who had a stronghold in the vicinity. Numerous barrows, or ancient tumuli, still exist. The population in 1881 was 8363.

BRIDPORT, a port and municipal and parliamentary borough in Dorsetshire, on the Brit, 135 miles from London by the road, and 154 by the Great Western Railway.

Bridport was a borough during the Saxon period; at the time of the Domesday survey it had 100 houses, a mint, and an ecclesiastical establishment. Its hempen manufacture is of remote origin; Camden notices a special law of Henry VIII.'s reign by which the navy was to be exclusively supplied with cordage made at Bridport. The earliest charter is 37 Henry III. This charter received subsequent confirmations up to 18 Charles II. By the Municipal Reform Act Bridport is divided into two wards, and has six aldermen (one of whom is mayor) and seventeen councillors.

The town, which is generally well built, consists chiefly of three principal streets, which are spacious and well paved. The public buildings are St. Mary's Church (thoroughly restored), St. Andrew's (a new and beautiful small church erected at the northern entrance to the town), various Dissenting chapels, Town-hall, good mechanics' institute, several schools, and union.

The staple productions of the town are twine, lines, sail canvas, and shoe thread. The exports consist principally of these manufactures and of butter, and the imports of hemp, flax, deals from the Baltic, wines, spirits, skins, coals, culm, and slates. Shipbuilding is carried on.

The municipal and parliamentary limits are co-extensive, and contained a population of 12,024 in 1881. From the reign of Edward I. to 1868 the town returned two members to the House of Commons, but it was deprived of one by the Reform Act of 1867, and of the other by the Redistribution Act of 1885.

The prosperity of Bridport is materially dependent on that of the harbour, which is at the mouth of the river Brit, about a mile from the town. Many efforts had been made to improve it, but with little success, till 1742, when a new pier was finished. Further improvements were made in 1756, and others in 1822, at a cost of £20,000. It is now safe for ships of 250 tons. The number of vessels which enter and clear annually is about sixty, of 6000 tons.

BRIE, a district in France, partly in Champagne and partly in the Ile de France. Meaux was its capital. It is now comprised in the departments of SEINE-ET-MARNE, AISNE, and MARNE.

BRIEF (in law) means an abridged relation of the facts of a litigated case, with a reference to the points of law supposed to be applicable to them, drawn up for the instruction of an advocate in conducting proceedings in a court of justice. The Scottish term for such a document is *summary*. It is the practice to endorse on the brief the fee which is to be paid to the advocate; and the general usage, or rather the general rule, is to pay the fee when the brief is delivered to the advocate.

BRIEF (CHURCH) or **KING'S LETTER**. This instrument consisted of a kind of open letter issued out of chancery in the king's name, and sealed with the privy seal, directed to the archbishops, bishops, clergymen, magistrates, churchwardens, and overseers of the poor throughout England. It recited that the crown thereby licensed the parsonages for the brief to collect money for the charitable purpose therein specified, and required the several persons to whom it was directed to assist in such collection. Church briefs appear to have been always abused, and for a long time were subject to heavy fees and enormous expenses, which were abolished by the 9 Geo. IV. c. 12. They are now no longer issued.

BRIEF, PAPAL, is the name given to the letters which the pope addresses to individuals or religious communities upon matters of discipline. The Latin name is *brevis*, or *breve*, which in the Latin of the earlier ages meant a short epistle or written scroll. The French in the old times used to say *brief* for a letter, and the Germans have retained the word *brief* with the same meaning to this day. The difference between a brief and a bull is this—the briefs are less ample and solemn instruments than bulls, and are private official letters addressed to individuals, giving the papal decision upon particular matters, such as dispensations, release from vows, appointments to benefices in the gift of the see of Rome, indulgences, &c.; or they are mere friendly and congratulatory letters to princes and other persons high in office. Like the bulls, they are usually written upon parchment, but the writing is in the Roman character, and on the smooth side of the parchment, ancient Gothic characters, and the rough side being used for writing a bull. A brief is sealed in red wax with the pope's personal seal of the Fisherman, St. Peter in a boat casting his net into the sea (Chappin, "Dissertatio de Abbreviationum Munere," cap. iii.). Briefs are not signed by the pope, but by an officer of the papal chancery called *Secretarius Brevis*. The pope always styles himself "Papa" in a brief, and addresses the recipient as "Beloved Son," concluding with the words, referring to the special seal used: "Given at Rome, under the Fisherman's ring, on the . . . &c." The popular name that a brief is so called by use of its closeness or the smoothness of its written characters, is absurd. The word simply means "letter."

BRIEG, a line manufacturing town of Prussia in Silesia, in the government of Breslau, is situated 28 miles by railway S.W. from Breslau, on the left bank of the Oder. It was formerly fortified, and still has a castle and an arsenal. It is also surrounded by walls, which have been partly converted into promenades. The Church of St. Nicholas is one of the most beautiful specimens of the baroque style in the province, and the principal object in the town. The industrial products are woollen cloth, cotton, linen, leather, shoes, &c. The principal occupations, &c. A short distance to the west of Brieg is the village of Mohritz, Brieg is one of the ancient towns of *Cassovia* (*the Riparian*), its name comes from the Polish *brzeg*, "edge," &c.

BRIEL, BRIELLE, or DRIL, a well built and fortified town of Holland, situated on the Meuse, and on the northern shore of the island of Vlieland, has a large and considerable harbour, and a large number of wharves, depots, and residences. The name literally signifies a place of spectacles, and is applied figuratively to it, as the market of Holland. It is the birthplace of Admiral Van Tromp, and De Witt. Brielle has a rich Dutch history, being the place where the first troops landed of the republic.

The expedition, notwithstanding the aid of the English, failed from the perspicacity of the Duke of Alva, who ordered by Queen Elizabeth, in consequence of the English representations of Alva to leave this kingdom. But the English, to despatch, they assembled a small fleet of 100 ships, under the command of William de Lumley, count of Buren, and resolved, if possible, to get possession of the city, and to break in their native enemy. Their object, however, was to make a small port on the coast, but the wind being so favourable, they cast anchor before Brielle, and took possession on the 1st of April, 1572. It was not till the first of May that apparently notwithstanding the great struggle between Holland and Spain, which was a long and desperate one, the former—a struggle which better we consider the sacrifices and perseverance of the weaker party, or the beneficial consequences of their union, a part of the most extraordinary and important of which history has preserved any account.

BRIENNE-NAPOLÉON or BRIENNE-LE-CHATEAU, a town in the department of Aube, France, 11

miles N.W. of Bar. Cotton yarn, hosiery, oil, and pottery are made. The famous military school of Brienne, in which Napoleon I. was a pupil from 1779 to 1781, was suppressed in 1790. In compliance with the last wishes of the emperor, the town was much improved after his death. It was the scene of a terrible conflict between the French and the Prussians and Russians on 29th January, 1814, when the town was burned entirely to the ground, and in which the Emperor Napoleon I. had a narrow escape, a Cossack who was making for him only falling from a pistol ball at his feet. The allies were victorious, and were consequently able to march direct to Paris.

BRIENZ, a town of the canton of Berne, Switzerland, situated on a lake of the same name, in a most beautiful position at the foot of the Bernese Alps. Population, 2800. The Lake Brienz is situated 1628 feet above the sea-level; it is 8 miles long, N.E. to S.E., by about 2 miles broad. The Aar enters from the vale of Hasli, charged with glacier mud, and of a whitish-gray colour, traverses the lake, depositing the suspended mud, and issues towards the Lake of Thun pure, and of a bright-blue colour; large deposits have thus been formed in several places, but chiefly at the upper end. The Lutschine aids in this process. It is surrounded by high mountains, down whose sides many fine water falls descend into the lake; one of the finest is the Giessbach, on the south side. The lake varies in depth from 80 to 350 fathoms.

BRIERLY HILL, a thriving manufacturing place in Staffordshire, 2 miles N.E. of Stourbridge, and 111 miles from London by the Great Western Railway. It is on the Oxford, Worcester, and Wolverhampton Railway, and contains extensive collieries, iron, glass, and brick works, and potteries. There is also a large establishment for the manufacture of steam boilers. The population within the local boundary in 1881 was 11,516.

BRIEUC, ST., a seaport town in the department of Côtes du Nord, France, stands on the Gouet, about 2 miles from its mouth, in a bay of the same name. The harbour at the village of Larnet, at the mouth of the river, is accessible to vessels of 350 tons. It has manufactures of woollen stuffs, linen, cotton, leather, paper, &c. There is an ancient cloth-dyeing, part of which dates from the eleventh century. St. Briens, an Irishman, is said to have founded a monastery here in the fifth century, and thus to have originated the town. The population in 1883 was 15,000.

BRIEVE, a term used in Scotch law. Its general character is that it directs an inquiry to be made regarding certain matters. The most important inquiry now conducted by juries is the inquest for services of heirs. This form is necessary for formally investing an heir in his ancestors' landed property.

BRIG, a square-rigged vessel with two masts. A brigantine, sometimes called an hermaphrodite brig, is a two-masted vessel with the foremast of a brig and the mainmast of a schooner.

BRIGADE, a term generally applied, in military affairs, to the union of two or more battalions or regiments in one corps, but sometimes to the union of a certain number of men in one subdivision. Thus from two to six battalions of infantry constitute a brigade, and one of cavalry may consist of two or three regiments. In the British service the commander of each brigade is entitled brigadier-general; his rank is immediately above that of colonel, and to assist him in his duties there is appointed a brigade major, who is usually a captain, or if a subaltern he holds in the brigade the rank of junior captain.

Not only the number of battalions which are united to form a brigade, but also the number of brigades which constitute a division, is various, both brigade and division depending upon the strength of the several regiments, and upon the nature of the service. In the Army Reorganization Act of 1872, however, the word brigade is defined as

meaning two line battalions of regular infantry, with the militia and volunteers of each military district. For the origin of the word see *BRIGANDINE*.

BRIG'ANDINE, a kind of armour of the middle ages, and frequently mentioned by writers of that period, used by the foot soldiers, who were called *brigands*. The word is particularly mentioned in the 4th and 5th of Mary, c. 2. The brigands were light-armed soldiers, and therefore could not wear the heavy armour of the times. A tolerably efficient substitute was found in small plates of iron sewed on to the body garments of quilted linen, and covered with leather or stout hempen cloth. The word comes from the Italian *brigare*, to strive or to fight, and means simply a "fighting man." The word *BRIGADE* has the same origin. These brigands were the Bashi Bazouks of the middle ages, light-armed irregular troops, picking up their own subsistence. It is easy to see how the word brigand would come to have its modern dishonourable meaning, a compound of a marauder and a kidnapper. The Italian word *brigante* has no such harsh meaning, and is equivalent to our "intriguer."

BRIGANTES, a tribe of Britons who occupied that part of England which includes the counties of York, Lancaster, Cumberland, Westmoreland, and Durham, with the exception of the south-east corner of Yorkshire, between the Humber and the sea as far as Flamborough Head, which was inhabited by the Paranti. The Brigantes were defeated in the time of Claudius by M. Ostorius (Tacitus, "Annal." xii. 32). Under Vespasian the Brigantes were totally defeated by Ptilius Cenabius, and the Romans took possession of the greater part of their country. Tacitus describes them as the most numerous tribe in the whole province of Britain ("Agricola," xvii.). In the division of Britain made by Septimius Severus, the Brigantes were in the province called Britannia Superior, of which Eboracum (York) was the capital, and afterwards in the new division under Constantine they were in the province called Maxima Cæsariensis.

BRIGHT, JOHN, an eminent English politician, was born 16th November, 1811, at Greenbank, near Rochdale. His father, Jacob Bright, who died at an advanced age and in possession of considerable wealth, had raised himself from the ranks to the position of an eminent master cotton-spinner, and enjoyed in his own locality a well-earned reputation for shrewdness and energy. Mr. Bright was the second of ten children, the eldest of whom died young, and in earlier years his own feeble health was a source of constant anxiety to his parents. He received his first education at a school in Rochdale, whence he was removed to one at Ackworth in Yorkshire, supported by the Society of Friends, to which his parents belonged, and of which Mr. Bright himself has ever been a member. From this school, however, his parents were compelled to remove him on account of the delicate state of his health, and he was placed for a time under the care of a tutor at a country place in Yorkshire. From these circumstances his education was less complete than his parents had desired; and Mr. Bright has in his public utterances frequently referred to this fact. In his address to the students of the University of Glasgow, delivered 22nd March, 1883, he said, "I am an entire stranger to university life. In the sense of the Latin words which we have just heard I may be said to be a man who never had the advantages of education. I had the teaching of some French, as English men teach French, and had the advantage of a year's instruction in Latin by a most admirable tutor—a country man of yours from the University of Edinburgh. There was not much Greek—not so much that any trace of it is left. There was nothing in the shape of mathematics or of science, and therefore, looking at education as you take it, I am a person who had the misfortune to have almost none of it in my youth." On reaching manhood he entered

his father's business, and successfully followed the avocation of carpet manufacturer from that time. In the agitation which preceded and accompanied the Reform Bill of 1831–32 he made his first appearance as a politician; but beyond the fact that he addressed his fellow-townsmen of Rochdale on the popular side of the question, no information has been preserved as to his speech, nor as to the impression he produced. In 1835 he made an extensive tour of the Continent, and also went to Palestine.

On his return home Mr. Bright began to lecture at a literary institution in Rochdale which he had helped to found. His first subjects were his recent experiences of travel, and thence, by an easy transition, he passed to lectures on subjects connected with industrialism and political economy. It was about this time, too, that he threw himself into one of those violent church-rate contests for which Rochdale had long been celebrated, and replaced the usual passive resistance of his sect by an active and energetic opposition. The name of John Bright was now well known as that of a steady and combative Rochdale radical, when suddenly a question arose which led to his exciting a local for a general notoriety. The Manchester Anti-Corn-Law Association was formed in the autumn of 1838, and Mr. Bright's name appears in the list of its first committee. The history of Mr. Bright's connection with the Anti-Corn-Law League involves the history of the league itself, an account of which is given in the article *ANTI-CORN-LAW LEAGUE*. Some of the notable events prominent events of the career of Mr. Bright concern his metropolitan exertions in 1843 to secure the return of Mr. Patterson, the free-trade candidate for the City of London, and his appointment at a great meeting of the Anti-Slavery Society in Fetter Hall during the course of 1844, where he advocated the application of free-trade principles to the slave question, and opposed the importation of a protective duty on slave-grown sugar. A proof of his unflinching perseverance, it may be mentioned, that when his first wife (Elizabeth, eldest daughter of Jonathan Priestman, Esq. of Newby, York, whom he married in 1839, and whom he lost in 1840) was dying, and he accompanied her to Leamington, he continued to give his lectures in the neighbourhood of London, and to travel over the Warwickshire canals to the recreation of the general benefits of free trade.

Mr. Bright first entered Parliament in 1843, two years after the return of Mr. Cobden for Stockport. In the spring of that year a very extraordinary representation of Durham, and Lord Dungannon was selected as the Conservative candidate. In a conference with the tactics of the league to offer a free-trade candidate who ever there was a vacancy, and whether success was probable or improbable, Colonel Perreux Thompson was put forward as the free-trade candidate, and Mr. Bright was despatched to Durham to advocate his claims and to forward his canvass. From some cause or other Colonel Thompson withdrew from the contest at the eleventh hour. There was no time to lose; Mr. Bright was on the spot, and the day before the election he issued his manifesto. He was defeated by a majority of 101. The return of Lord Dungannon, however, was petted against, and he was unseated for bribery. The contest was renewed, and in July, 1843, Mr. Bright was returned by a majority of seventy-eight.

Mr. Bright's first speech in the House of Commons was made towards the end of a session, and in a then house, on the 7th of August, 1843. It was in support of a motion of Mr. Ewart's for the reduction of import duties, and its delivery betrayed a certain nervousness. From this period onward to the repeal of the corn laws his labours were incessant both at public meetings and in Parliament, though at that time he attained neither with the public nor the House of Commons the commanding influence exercised by Mr. Cobden. In 1845 Mr. Bright presented

appointment of a select committee of the House of Commons to inquire into the action of the game laws, which printed its evidence without a report the following year. An abridgment of this evidence, with an "Address to the Tenant Farmers of Great Britain" from his pen, was published at his expense in 1846. During the period of this Parliament he also obtained the appointment of a select committee on the cotton cultivation of India, which printed the result of its labours in a huge Blue-book, that has been the subject of frequent reference in the succeeding discussions on this subject.

The general election of 1847, which followed the repeal of the corn laws and the overthrow of the Peel ministry, placed Mr. Bright in a higher position than any he had yet aspired to. Mr. Mark Phillips retired from the representation of Manchester, and the friends of Mr. Bright wished to see him the colleague of Mr. Milner Gibson in the representation of that important constituency. The Liberal party of Manchester was divided. The old Whigs disliked Mr. Bright's radicalism, and resented the influence of the League, the local members of which were favourable to the claims of Mr. Bright. Mr. Cobden was invited to stand, but he refused. Lord Lincoln was then persuaded to become a candidate, but dissatisfied with his chances of success, he withdrew after his committee had been formed, and Mr. Bright was returned without opposition. The ensuing six years of Mr. Bright's life, public and parliamentary, were active and busy. "Out of doors" he co-operated no longer as a subordinate, but as an equal with Mr. Cobden, in various agitations for financial and parliamentary reform, but not with the marked success which had attended the free-trade movement. In Parliament Mr. Bright spoke with increasing frequency, and succeeded gradually in the difficult enterprise which is termed "gaining the ear of the house." Besides urging the ordinary views of a Radical politician, he produced a marked effect by his treatment of the Irish and Indian questions in 1848 and 1850. After the formation of the first Derby ministry, and the consequent dissolution of Parliament, his return for Manchester was opposed; but the cause of free trade was thought to be once more in danger, and moderate Liberals themselves, though disagreeing with many of his views, refused to countenance the attempt to oust him from the representation of Manchester at such a crisis. After a contest he was again returned by a large majority. He had been from the outset of his public career a strenuous advocate of international peace, and he offered the most determined opposition to the making of war against Russia in 1854. He was one of the meeting of the members of the Society of Friends by whom the famous deputation was sent to the Russian emperor Nicholas, to urge him to maintain the peace of Europe. In this matter, however, Mr. Bright went against the feeling of the nation, and for a time he was extremely unpopular with the public in general, and also with his own constituents at Manchester; and though he has ever since maintained that on this point he was in the right, and the majority of the nation in the wrong, his view of the matter has not yet obtained universal acceptance. Soon after the formation of Lord Palmerston's ministry Mr. Bright was compelled by ill-health to withdraw from attendance at Parliament, and to seek repose and change of scene in the Continent. The general election of 1857 found him re-elected in his old seat Manchester rejected him as a representative. On the death of Mr. Muntz he was elected in August, 1857, one of the members for Birmingham, and resumed his parliamentary duties; and it was Mr. Bright who seconded the motion of Mr. Milner Gibson against the second reading of the Conspiracy Bill, which led to the overthrow of the government of Lord Palmerston. He now renewed his exertions in favour of an extensive reform in the representation of the people, and the Conservative party brought forward

a reform bill in 1859. On the return of the Liberals to office, it appeared that Lord Palmerston was not disposed to close his career as a statesman by attempting to carry any such measure as Mr. Bright had demanded, and for a time a tacit armistice upon this question seemed to be agreed upon by both parties. In the year 1860 the negotiations for the conclusion of a commercial treaty with France were brought to a successful termination by Mr. Cobden, a measure to which Mr. Bright accorded hearty and valuable support. During the civil war between the northern and southern portions of the United States, which commenced at the close of 1860, Mr. Bright remained a steadfast friend of the North, and firmly opposed the proposals that were made for the recognition of the Southern Confederacy. A determined opponent of slavery, he was unwearied in his efforts to point out to his countrymen that it was this question which was at the bottom of the struggle, and to urge upon them the claims of the Federal government to their sympathy and support. His speeches delivered about this time will ever rank among the finest of his public utterances, and they exercised a vast influence over public opinion. There can be no doubt, moreover, that his efforts and those of his friends in this direction did a great deal towards calming the angry feelings excited in the Northern States by the utterance of the friends of the South in England, and served to make the subsequent reconciliation between England and the United States more easy of attainment. The gratitude of the people of the United States has been deep and lasting, and has found frequent expression ever since. In 1865 Mr. Bright lost, by the death of Mr. Cobden, one of his dearest and most intimate friends, with whom he had laboured for the public good for a period of over twenty years. The same year was marked by the death of Lord Palmerston; and the question of the reform of the electoral representation came again prominently forward. In 1866 a reform bill was introduced by the Liberal government, which, though it did not carry out his views on the matter, yet received the support of Mr. Bright, and when the government were defeated, and resigned in consequence, he took a prominent part in the extra-parliamentary agitation that was maintained for the solution of the question. In the end the Conservatives brought in a measure in 1867, which, after being considerably amended by the Opposition, became law the same year. The measure, as ultimately carried, was largely based upon the ideas of Mr. Bright. In the session of 1868 he took a prominent part in the debates on Ireland, and condemned both the *laissez-faire* and the merely repressive style of policy. He was a warm supporter of the disestablishment of the Irish Church; and when Mr. Gladstone became prime minister he prevailed upon Mr. Bright to accept a seat in the new cabinet as president of the Board of Trade. This was in December of 1868, but in December, 1870, Mr. Bright was compelled by ill-health to resign this office, and to retire for a time from his public labours. In the summer of 1873 there was a reconstruction of the Liberal cabinet, and Mr. Bright accepted the office of chancellor of the duchy of Lancaster—a post which he retained until the defeat of the government at the general election of 1874. During the next six years, in which the Conservatives remained in power, the reopening of the Eastern question by the Turkish massacres in Bulgaria brought Mr. Bright again to the front as a determined opponent of the policy of Lord Beaconsfield. From the first he protested against any alliance with Turkey, and his labours both in the House of Commons and before the public were directed towards the maintenance of peace. At the general election of 1880 he was again returned for Birmingham, and when Mr. Gladstone was called to office Mr. Bright again accepted the post of chancellor of the duchy of Lancaster. To the legislative measures brought forward by Mr. Gladstone for the

better government of Ireland, Mr. Bright accorded powerful support, though he was obliged also to acquiesce in the coercive measures rendered necessary by the action of the professional agitators and the secret conspirators by which that unhappy country was infested. Having ever been an earnest advocate of the policy of peace and non-intervention, he was, however, unable to agree with the other members of the cabinet on the despatch of the Egyptian expedition, and he accordingly resigned office on July, 1882.

On the 15th November, 1880, Mr. Bright was elected lord rector of the University of Glasgow, in succession to Mr. Gladstone. It was understood that Mr. Bright was to be at perfect liberty to deliver his rectorial address at any time he pleased during his period of office, and he did not meet the students in this way until 22nd March, 1883.

It does not fall within the scope of the present notice to present any estimate of the influence exerted by Mr. Bright during the long period in which he has been before the nation as a public man. All parties are now agreed to admit that whatever may be the estimate of his political opinions, there can be no question as to the honesty and sincerity of his character, nor to the earnest and disinterested zeal he has displayed for the public welfare. As an orator he takes rank among the first of the English-speaking race. A thorough master of the language, his orations, marked as they are by clearness and force of argument, and richness of illustration, by a flow of genuine humour, and always pervaded by moral earnestness and elevation, have not only exercised a vast influence over the minds of his countrymen, but they form a part of the literary treasures of this generation which will not readily be laid aside.

Perhaps no better account could be given of the ideal he has ever had in view in his public labours than that which he urged upon his hearers in his address at Glasgow, to which reference has already been made, where, after reference to the past history and present condition of the British empire, he said—"To me it appears that we have trodden for two centuries past—I keep myself to that, because since that time the public opinion of the country has had a greatly increased influence—I say for two centuries past we have trodden in the footsteps of the Cæsars, and have accepted the barbarous policy of pagan Rome, whilst at the same time, with vast and unceasing hypocrisy, we have built thousands of temples, and have dedicated them to the Prince of Peace; and I say, with grief and shame, that they who have ministered at his altars have for the most part on these matters been absolutely dumb. Now, I ask you this question, Shall we reverse this policy? Shall we strive to build up the honour, the true honour, and happiness of our people on the firm basis of justice, morality, and peace? I plead not for the great and for the rich. I plead for the millions who live in the homes of only one room. Can you answer me in the words—words which were quoted years ago on a somewhat like occasion, which fell from the crowned minstrel who left us the Psalms?—'The needy shall not always be forgotten; the expectation of the poor shall not perish for ever.'"

BRIGHT'S DISEASE, the name given to several different though closely related forms of kidney disease, from the fact that the attention of the medical profession was first called to them by Dr. R. Bright in 1837. Of these diseases the most common are the inflammatory affection of the kidneys, or acute Bright's disease, the waxy or amyloid affection, and the cirrhotic or gouty affection—the two latter being of a chronic character. The first of these (acute Bright's disease) may be induced by a variety of causes, among the most prominent of which is the exposure to cold, either suddenly in a way that causes a check to perspiration, or the same influence acting slowly and continuously; the abuse of alcohol, especially in the form of ardent spirits; or it may be the result of a blood disease, such as scarlatina or diphtheria. Its onset is gene-

rally marked by the presence of a dull aching pain in the limbs and loins, and a sense of weariness and depression. This is soon followed by feelings of a feverish character, heat, and intense thirst, and a swelling of the trunk and limbs, the face being puffed and the eyelids swollen. The urine is usually greatly diminished in quantity, is often dark-coloured or even bloody, and the presence of albumen and of tube casts from the kidneys can be detected in it by the physician. The disease, in some cases, is rapidly fatal, but in a great majority the patient either recovers entirely, or the disease passes into its chronic form. Recovery is marked by an abatement in the fever, the skin becomes moist, there is an increase in the flow of urine, and the dropsy gradually disappears. After recovery great care must be taken to avoid exposure to wet or cold, and should it be in winter, a change of air to a warm sheltered locality is likely to prove of great benefit.

The second form of the disease mentioned, viz. the waxy or amyloid affection of the kidneys, may be a result of an attack of the acute disease, but in the great majority of cases it is not so. It often begins slowly and insidiously, and it may exist for months, or even years, without being detected. It may be caused by the exhaustion arising from any wasting malady, such as consumption, chronic rheumatism, decaying bone, &c., or from long-continued abuse of alcohol. It is sometimes brought about by constitutional syphilis, or is a result of a tainted contracted years previously. As the disease becomes developed the patient notices a decay of strength, and becomes disinclined to make any exertion. He is troubled by an excessive discharge of urine of a pale colour and low specific gravity, at first containing little or no albumen, but afterwards a considerable amount.

The third form of this disease mentioned, viz. the cirrhotic or gouty affection, may, like the other forms, be induced by excess in alcohol, especially in the form of spirits, and it may be a result of gout or the absorption of lead into the system, but it sometimes comes where neither of these causes exist, and where no special reason can be assigned. Like the second form it comes on insidiously, its existence being undetected sometimes for a long period. Then attention is called to it by the existence of a slight amount of albumen in the urine, the complexion and the appearance of the eyes become changed, the stomach is disordered, and the heart and lungs become also affected; various complications arise from these affections, and from some one or more of them death is brought about. It will readily be seen from the foregoing that these diseases are eminently unsuited to domestic treatment. In all cases the best medical aid obtainable should be procured as soon as possible.

In very many cases the treatment is completely successful, and patients fully recover from the disease, and even in those cases where it cannot be wholly conquered life may often be prolonged for a number of years. It should also be mentioned that some of the symptoms which have been indicated may arise from many other causes than the presence of these diseases. Where there is any suspicion felt skilled advice should be sought. The diagnosis of these affections is comparatively easy to a properly trained medical practitioner, who, by a few simple tests, can often remove groundless fears, or, should disease be present, can indicate the proper means for its removal.

BRIGHTON or **BRIGHTHELMSTONE**, a parliamentary and municipal borough in Sussex, 50½ miles S. from London by the railway. It was constituted a parliamentary borough by the Reform Act, and returns two members. By a charter dated April, 1854, the municipal borough is divided into six wards, and governed by thirteen aldermen, including the mayor, and thirty-eight councillors.

Brighton stands near the centre of the curved line of coast of which the east and west points are respectively

The best part of Brighton may be described as composed

BRIGNOLES, a town in the department of Var, France, beautifully situated in a pleasant valley on the Calami. It is about 22 miles N.N.E. of Toulon. It has a public library, a normal school, and a palace, formerly

the property of the counts of Provence. Its principal ornament is its magnificent public fountain, in the Square Carani.

There are manufactures of silk, thread, and leather, and a considerable trade is carried on in olive oil, wine, liqueurs, brandy, and excellent prunes, known by the name of *brignoles*.

Brignoles is an ancient town, and from the fact that the children of the counts of Provence were generally brought up in its castle, was often called *Villa Provarum*. The population in 1883 was 5500.

BRIHUEGA, a town of New Castile, Spain, on the Tajuña, is chiefly celebrated as the scene of the surrender of the English under General Stanhope to the Duke of Vendôme in 1710, during the War of the Succession. The town has manufactures of woollens, linen, glass, and leather.

BRILL (*Rhombus laevis*) is a fish belonging to the same genus as the Turbot, from which it may be readily distinguished by its increased length and decreased breadth. The bony conical tubercles of the turbot are replaced by small distinct scales. The bill rarely exceeds 8 lbs. in weight. Though not so delicate in flavour as the turbot, it is much esteemed for the table. It is caught both in sandy bays and in deep water off the coasts of Britain. It is also found in the North Atlantic and the Mediterranean.

BRILLIANT is the term given by lapidaries to the form in which some gems are cut. A thick stone is necessary to make one, the depth not being much less than the breadth. There are several varieties, as Lisbon cut, or double brilliant; split, or trap brilliant; full brilliant; and half brilliant. A brilliant consists of two truncated pyramids, on which are cut alternate triangular and lozenge facets. The upper one, which is one third the depth of the stone, is termed the *crown or bi-ct*; the lower two-thirds is the *calasse or pavilion*; they meet at the *girdle*, the edge grasped in mounting. The top of the bi-ct is a large plain surface, the *table*; the bottom of the pavilion a small plain surface, the *collet*. On the sides of the bi-ct are wrought the *star facets*, triangular facets terminating at the table; *upper skew or skill facets*, triangular, but terminating at the girdle, *lozenges* and rhombal facets intervening. On the pavilion are wrought the *under lozenge and skew or skill facets*, the latter terminating at the girdle. In a well-cut brilliant all the light not reflected by the bi-ct is returned by the pavilion, and passes out through the bi-ct facets as refracted coloured rays; when, therefore, it is held between the light and a screen it casts a dark shadow, except at the small spot of light passing through the collet.

BRINDISI, the Roman *Brundisium*, and Greek *Brentesium* (*Brentesion*), a town in the province of Lecce, in Italy. It was the chief port of embarkation of the Romans from Italy to Greece. There was an inner and an outer harbour. The origin of Brundisium is lost in the obscurity of the ante-Roman times. Tradition spoke of a Cretan colony having early settled there. It was one of the chief towns of the Messapian peninsula, and of that part of it called Calabria by several ancient geographers. After the war of Pyrrhus and the subjugation of Lucania, the Romans, under the consuls M. Attulus Regulus and Lucius Junius Lili, turned their arms against the other towns of Messapia and seized Brundisium among the rest, about 267 B.C. Brundisium was then made a Roman colony. The Via Appia terminated at Brundisium. There is a column which is said to mark the termination of the road, but which more probably belonged to a temple. Upon it the name of Spathalupus, the Byzantine governor, is engraved. He rebuilt the town after its destruction by the Saracens in the tenth century. Julius Caesar attempted to block up Pompey's fleet that had met in the inner harbour, by running mounds into its outlets, which has been said to have commenced its ruin; but the calamities which

befell Brindisi after the fall of the Roman empire, when it was taken and retaken by the northern barbarians, the Greeks, and the Saracens, contributed to the deterioration of the harbour. Under the Angevins the inner harbour had already become a stagnant pool separated from the sea. Other marshes formed in the neighbourhood, and the air of the town became seriously affected. The population of Brindisi was reduced to less than 3000, and was threatened with total destruction by the pestilential atmosphere, when King Ferdinand IV. in 1775, ordered the communication with the inner harbour to be restored. A cut was made across the isthmus, and the sea water, being thus let in, and the other marshes at the same time partially dried up, the air of Brindisi improved. It was the birth-place of Panyinus, and Virgil died here, and it is associated with the journey of Horace, described in the 5th Sat. of his 1st Book.

The present town of Brindisi occupies a small part of the site of the ancient city. It is surrounded on two sides by walls and ditches, and has a castle called Fort St. Teresa, commanding the northern arm of the inner harbour. The town is the see of an archbishop; the cathedral is a large building of the Norman times. The town is ill built, badly paved, and dirty, notwithstanding that a few years since a very bright future seemed in store for it, in 1868 the Italian government agreed to exact plans for the improvement of the port, including a breakwater, mole, and a retreating wall in the outer harbour, a boundary wall in the connecting creek, and two quays in the inner harbour. All these works are now completed, and vessels of any size can go into the inner harbour—which is a natural dock—be moored alongside the quay, and take their cargo at once in any weather. The safety and convenience of the town has also been greatly improved by extensive dredgings of the shallow parts of the inner harbour. The war between France and Germany, in 1870-71, however, some time closed the mole to the East and Mediterranean, there was no alternative but to send the mails from Belgium and Germany, by the Brenner Pass to Brindisi, and thence to Alexandria. The route was found so convenient and economical that it has been continued ever since, and Brindisi has also become the most important port of call in the Adriatic for the mail steamers of Austria and Italy. The population in 1882 was 16,419.

BRINDLEY, JAMES, was born in 1716 at Horwsett, a few miles from Chapel-en-le-Whith, in Derbyshire. At an early age, though deprived of the advantages of even a common education, he evinced a manifold talent for resources far above the common order. He served his apprenticeship to a millwright, and in that capacity became highly trained. In 1757 he was consulted by the Duke of Bridgewater on the practicability of constructing a canal from Worsley to Manchester. (See BRIDGEWATER.) His success in this undertaking was the means of fully awakening public attention to the advantages of canals; and in 1766 the Trent and Mersey Canal was commenced under Brindley's superintendence. It is 23 miles long, and meets the navigation of the Mersey with that of the Trent and the Humber. It was called by Brindley the "Grand Trunk Navigation," owing to the probability, from its great commercial importance, that many other canals would be made to join it. Brindley next designed a canal 16 miles in length, called the Staffordshire and Worcestershire Canal, the purpose of connecting the Grand Trunk with the Sever. He also planned the Coventry Canal, but did not superintend its execution. He, however, superintended the cutting of the Oxford Canal, which connects the Trent with the Grand Trunk through the Coventry Canal.

The canal from the Trent at Stockwith to Croston, 14.16 miles long, was Brindley's last public employment. He also surveyed and gave his opinion on many other proposed navigable canals besides these mentioned. Brindley died

at Turnhurst, in Staffordshire, on the 27th September, 1772, aged fifty-six. To the last he remained an unlearned man, herein differing totally from George Stephenson, whose career in other points his own is sometimes held to resemble. His habit, in any difficult work, was to lie in bed two or three days and think it out. It is quite true that, being pressed in an examination before the House of Commons concerning the effect of so many canals on river navigation, his mind was so full of his great work that to the question, "Of what service will the rivers be then?" he replied, "To feed navigable canals." Many similar well-authenticated anecdotes of Brindley's quaint preoccupation have been preserved.

BRINE SHRIMP (*Artemia salina*) is a crustacean of the subclass *ENTOMO-STRECA*. This singular little creature is about half an inch in length, and very transparent. It abounds in myriads in the brine pans at Lymington, in which the water contains about a quarter of a pound of salt to a pint of fluid. It is also found in some of the salt lakes in Siberia, and is especially abundant in Great Salt Lake in Utah, North America. It swims about with great rapidity, and is in perpetual motion, revelling in a solution of salt so concentrated as to destroy most marine creatures instantly. The workmen consider this little shrimp as essential to the purity of the water, and are anxious to promote its increase. These animals undergo remarkable changes in their progress from the egg to maturity.

BRINJAL. See EGG-PLANT.

BRINVILLIERS, MARQUISE DE. The notorious Marie Marguerite, Marquise de Brinvilliers, was the daughter of Druy d'Aubrai, *lieutenant civil*, and was married to the marquis while yet a girl in 1651. The times were licentious, and if the young marchioness had been guilty of no more than immodest conduct with her lover, De St. Croix, it is possible we should have heard nothing of her. Her husband bore his domestic misfortunes with the calmness usual at this period; but her father was ill-advised enough to throw the pair into the Bastille. Madame de Brinvilliers, in despair, took to fervent religious exercises, and was exemplary in visiting the sick—the other very frequent fashion of the times for disappointed sinners. But St. Croix, in the Bastille, made acquaintance with an Italian called Paul, a man acquainted with the most subtle poisons known to the Lord of Borgia. On his release the lady dropped her religious practices, but continued her hospital duties, in order, as she herself afterwards confessed, to test the *efficacy of the poisons* which St. Croix prepared. As soon as she was satisfied she poisoned her father, her two brothers, and her sister, all in 1679. Her motive was to get money by inheriting their fortunes. Her husband was saved, as she herself believed by St. Croix, who seems to have been afraid of being rendered free to marry so cold-blooded a monster, and therefore gave Brinvilliers antidotes to keep him alive; certainly he escaped with some slight indisposition. Proud of her skill, this avowed woman ventured to usurp the functions of divine retributor, and dealt death to individuals, and in one case to a whole family, where she considered injustice had been done; but it is apparently without any selfish motive, for she reaped neither benefit therefrom, nor that of some her diabolical plans succeeded. Finally St. Croix fell a victim to the gallium from which he poisoned her in the act of preparing, and fell dead in 1672. As he had no relatives his papers were sealed; but Madame de Brinvilliers frantically endeavoured to become the possessor of a certain box, and her eagerness caused special examination to be made. Papers of receipts for poisons, and memoranda implicating the dead man and his poisoner were found. The secretary of the marquise, a certain Chateaux, was seized, and confessed all he knew. He was broken on the wheel. The poisoner herself escaped to England, and passing thence from place to place, finally took refuge in a convent at Liege. Here she

was captured by a police officer in the disguise of a priest, and brought to Paris to be tortured. As she stood before the rack she asked what the large bucket of water she there saw was for. The executioner replied that it was for her to drink when the thirst of pain became maddening; and, indeed, she drank every drop. She resisted the dreadful torture with most heroic fortitude, but eventually her strength broke down, and she made a full confession. She was beheaded, and afterwards burned, 1676.

BRIONIC ISLES, three islands on the N.E. coast of the Adriatic, a little N. of Pola, in the Austrian circle of Trieste. They contain the quarries from which the Venetians obtained the ash-gray marble of which their palaces are constructed. The largest is called Brioni; the other two, Coseda and San Girolamo.

BRIOUDE, a town of France, in the department of Haute-Loire, in a vast plain near the Allier, 30 miles N.W. of Puy, on the railway from Clermont to Puy. The town is old, ill built, and dirty. Its most remarkable edifices are the college, situated on a hill, and commanding a fine view, and the Church of St. Julian, a venerable Gothic fabric, founded in the ninth century.

Brioude has manufactures of linen and woollen goods, and a trade in the agricultural produce of the district. It was the birthplace of the Marquis de Lafayette, who acted so conspicuous a part in the American and French Revolutions. At Old Brioude, about 3 miles S.S.E. of Brioude, is a bridge over the Allier, built in 1845, consisting of a single arch 182 feet in span. The ancient name of Brioude was *Brius*. Population, 4635.

BRISBANE, an episcopal city in Stanley county, and the capital of Queensland, is situated on the river Brisbane, which surrounds it on two sides (58 feet above sea-level), about 25 miles from its debouchement into Moreton Bay, one of the largest bays on the coast of Australia, after which for a long time the district was called. It lies about 500 miles N. of Sydney. Its chief buildings comprise several churches and chapels, among which St. Stephen's (Roman Catholic) Cathedral is a fine imposing edifice. St. John's, by the river side, is the largest Episcopal church, and is the cathedral. It has a wooden bell-tower, with a peal of eight bells, adjoining the building.

The chief public buildings are the Town-hall, which has a frontage of 99 feet; the Houses of Legislature, the largest buildings in the city, which cost upwards of £100,000 in their erection; and the vice-regal lodge. The shops are quite equal to the similar class of buildings to be found in an English town. The city has a good general hospital, a female refuge, a sick children's hospital, an orphanage, and several other institutions of a charitable character. It has an excellent botanical garden, and there are numerous educational establishments. The extension of the city backward from the river is much hindered by the lumpy nature of the ground, and the formation of the roads has been attended with a large expenditure of money and labour. Brisbane is lighted with gas, and well supplied with water from a large artificial lake in the ranges near the heads of the Enoggera Creek, 7 miles distant from the city, and a thorough system of drainage has been carried out. The climate of Brisbane is, as a rule, dry and healthy, though the temperature is high in the summer months. The mean external shade temperature is about 70°. Connecting North and South Brisbane is a magnificent iron bridge, called the Victoria Bridge, on the lattice-girder principle, with swing openings to allow of the passage of ships. Its entire length is 1080 feet; length between abutments on shores, 1013 feet. It was commenced in 1863, and opened in 1874.

Brisbane has a flourishing trade in the export of wool, cotton, tallow, and hides, and in the importation of all kinds of European goods. There is ample wharf accommodation for a much larger amount of tonnage than enters

the port. Owing to the bar at the mouth of the river, and the shallowness of the river itself, vessels drawing more than 16 feet of water cannot come up to the city. The channel is being deepened, and eventually it will be dredged to a depth of 25 feet. A spacious dry dock at South Brisbane, completed in 1881, takes in the largest vessels visiting the port.

Brisbane is divided into four portions—North Brisbane, South Brisbane, Kangaroo Point, and Fortitude Valley. The area of the city is 2138 acres, and the population in 1881 was 31,109. Brisbane was originally settled in 1825, having been made a penal station by Sir Thomas Brisbane, the governor at that time of Australia, from whom its name is derived. In 1842 the colony was opened to free settlers; and since that time the city has made steady progress.

BRISBANE, SIR THOMAS MAKDOUGALL, BART., a distinguished soldier and astronomer, was born at Brisbane, near Largs, Ayrshire, on the 23rd of July, 1773. He entered the army in 1789, and served in Flanders. In 1796 he went to the West Indies, and was present at the taking of St. Lucia, St. Vincent, Trinidad, Porto Rico, &c. In 1812 he joined Wellington in Spain, where, in six general actions, he commanded a brigade, fought in fourteen battles, and took part in eight sieges. For these services, and for his conspicuous bravery at the battle of the Nive, he received the thanks of Parliament in 1813. After the abdication of Napoleon I. he was sent to North America, and was afterwards appointed governor of Jamaica and of the Island of St. Vincent. In 1821 he was sent out as governor to New South Wales, where he remained four years. During this period he was unceasing in his efforts for the welfare of the colony, and he succeeded in effecting great improvements in its condition, the amount of land under cultivation being doubled during his governorship. In addition to these labours he established an observatory at Paramatta, and with the aid of two assistants he prepared a catalogue of 7385 little-known stars. For this work, which is known as the "Brisbane Catalogue of Stars," he received the Copley medal from the Royal Society. When he left the colony he presented his observatory to the British Government, and taking up his residence at Makerston, in Scotland, he erected another, furnished with special reference to the pursuit of magnetical and meteorological knowledge. Ably seconded by his assistant, Mr. Brown, he made a series of valuable observations, which were published in three large volumes in the "Transactions of the Royal Society of Edinburgh," of which he was for many years the chairman. He died on 27th January, 1860.

BRISSET, JEAN PIERRE, who assumed the name of *De Warrille*, a celebrated Girondist politician during the French Revolution, was born at Onarville, near Chartres, on the 1st of January, 1764. He was educated for the bar, but abandoned the practice of the profession in favour of literature. His first work, "*Théorie des Lois Communales*" (two vols. 8vo, 1780), was dedicated to Voltaire, who honoured it with his approbation. This was followed in 1782-86 by his "*Bibliothèque des Lois Criminelles*," a work in ten volumes, which further established his reputation. Having removed to London, he published a metaphysical work entitled "*De la Vérité, ou Méditations sur les Moyens de parvenir à la Vérité dans toutes les Connaissances humaines*," and started a journal entitled the *Lycée*, which was unsuccessful. Returning to France he wrote numerous pamphlets on political subjects, his zeal in the cause of Liberalism rendering him odious to the government. An anonymous pamphlet, of which he was not the author, being attributed to him, he was imprisoned in the Bastille; but having proved his innocence he was set at liberty after a detention of four months. Continuing to write against the government, he was soon after compelled

to retire to England, from which he speedily removed to the United States, where he became enamoured with the democratic and federal form of government which prevailed there. On his return to France he addressed, to the members of the States-general, a "Plan of Policy for the Deputies of the People," and started a vigorous journal entitled *Le Patriote Français*, which gathered round him a group of earnest reformers, who were at first nicknamed "Brissotins," becoming afterwards the party of the Girondists or the Girondists. In the Convention he was the representative of the department of Loire-et-Loir. Here his moderation gave great offence to the fiercer members of the Mountain or Jacobin party, and ultimately, after the Girondists had vainly opposed the execution of the king, it led to his being accused with the rest of them of conspiring against the unity and indivisibility of the republic. Brissot attempted to escape, but was recognized and arrested at Moulins, brought back to Paris, and in company with his friends thrown in prison. During the trial, which lasted a week, he maintained a quiet dignity, and faced the guillotine with undaunted courage on the 31st of October, 1793. His works contributed not a little to influence the ideas and progress of the Revolution, but they have now only an historical interest.

BRISTLES are modified hairs, distinguished by their denser firmer character, found in various mammals. Those used in commerce are obtained chiefly from the backs of wild boars and of domesticated swine, and are employed in saddlery and shoemaking, but more especially in the manufacture of brushes. They are obtained in the largest quantities from Russia and Germany, smaller supplies being procured from Poland, Denmark, Belgium, and France. British bristles are not to be had—the old breeds that furnished them having given way to improved ones, which are almost without hair. Bristles are of various colours—black, gray, yellow, and white, or "hily coloured," the latter description being the most valuable. There is a great difference in the price of bristles, those of fine quality often fetching ten times as much as that paid for the coarser kinds. The imports of bristles into the United Kingdom in 1882 amounted to 2,563,975 lbs., valued at £412,239.

BRISTLE-TAILS. See THYSACTERA.

BRISTOL, a city and seaport, 118½ miles by Great Western Railway from London, lying between the southern border of Gloucestershire and the northern of Somerset, but independent of both these provinces, having been created a county in itself by a charter of Edward III. The city lies in a somewhat triangular basin formed by the valleys of the Avon and the Frome, by which rivers it is intersected, the former dividing the upper part of the borough from the lower. It stands on seven localities, which, however, are very inferior to the surrounding heights, of which that to the west is Clifton. The Redcliff and Temple districts, south of the Avon, are peculiarly reckoned in Somerset, and the territory north of that river in Gloucestershire, "Bristol Bridge" being the link between these counties. Though the defensive earthwork or camp on Clifton Down, together with two corresponding fortresses on the opposite sides of the Avon, adjacent to the city, are considered by someologists to have been thrown up by the Belgæ British before the Roman conquest of the country, few or no vestiges of early settlement have been discovered on the site of the city itself. But the existence of Druidical and Saxon masonry of Bristol in 1836 shows that the place was a habitable town and had a name before the Norman conquest. The castle, of which there remains some portions of the outer walls, and two early English vaulted chambers, is situated on Clifton Down, and appears first in history in connection with Godfrey Mowbray, bishop of Chester and father to "Fouled," the chivalrous hero of Tasso's "*Jerusalem Delivered*," who was at Bristol in A.D. 1088, in company with Robert Mowbray, his nephew, "a proud and chivalrous

man." These had joined with Odo, bishop of Bayeux, against William Rufus, in favour of Robert, earl of Normandy, and the castle of Bristol was their central stronghold. The plot failed, and the rebellious prelates were driven out of the kingdom. Rufus being now in peaceable possession of the kingdom, granted the royalty or honour of Gloucester, including Bristol and its castle, to his cousin Robert Fitzhamon, whose daughter and heiress, Mabel, marrying Robert, earl of Gloucester, natural son of Henry I., brought her splendid dower into the possession of that powerful baron, and thence to his descendants. The castle was reconstructed by Earl Robert (A.D. 1138), and became one of the strongest fortresses in the kingdom. It was about two-thirds the area of the Norman town, against the eastern wall of which it stood, being as much intended to overawe as to protect the inhabitants. Bristol, however, has greater reputation as an ancient town than as a military city. The fame of its fortified wall and many-towered fortress has passed away almost as completely as their material structures, but as a city of churches few mediæval boroughs can boast so many interesting remains. Notwithstanding the late destruction of St. Werburgh's, thirteen ancient churches exist in a more or less perfect state, and among these are such stately edifices as the Cathedral, St. Mary Redcliff, St. Stephens, and the Temple churches, besides various parish churches of importance. But though Bristol has always been a "city of churches," it has never been particularly an ecclesiastical city or town, such, for example, as Lincoln, Gloucester, or Wells. In these and kindred boroughs the central power was formerly vested in the spiritual head, but in Bristol there existed no sovereign abbot or bishop, and the churches and monasteries, having no joint corporate jurisdiction, were separately too weak to usurp the force of the secular arm. The town belonged to the crown from the date of John's accession (that sovereign having acquired the honour of Gloucester by marriage with Avis, a daughter of William son of Robert, earl of Gloucester), and had been leased out, as a lease is let by its own proprietors, to Lucy de Clou, as in one charter, A.D. 1310, to Bartholomew de Badlesmere, who held castle, town, and borough, at the annual rent of £210, the whole payment to be at that lord's own expense, but more properly to the king, as themselves, who held it (except the castle) with very little interference from the accession of Edward III., at the yearly rental rent of £160. In the reign of Richard III. £60 of this rent was released by that king in consideration of the great losses which the town and merchants had recently sustained, and the remainder was reduced in the reign of Charles I. The high steward is elected by the corporation and is for life. The office is entirely honorary, and is always filled by a nobleman or person of distinction. Ancient high stewards occur in the names of Sir Harry Vere and Oliver Cromwell. The present high steward is the Duke of Beaufort, who is also the lieutenant of the county of Bristol.

In 1137, at which time Bristol belonged to the crown, the king was required to furnish a representation of the royal power to the town to the royal exchequer. In the next century the crown's revenue in ships and boats amounted to 220 vessels, with the particulars of their service and value to the kingdom being £21 16s. 8d., amount 2,000 tons. About the merchants of this period was William of Wykeham, the Yeoman of whose magnificence Robert Fitzhamon was the executioner, who was perhaps the greatest merchant in England. Between 1150 and 1190 there were on average 800 seamen in the navy, and of his forces, which had an aggregate burden of 1,553 tons, a battle was concluded between Henry VI. and the King of France, in which he was suffered to sink to Ireland and France. A mayor of the town and a hundred aldermen to the Lord of the town. He entertained Margaret of Anjou when he visited Bristol in 1456,

to quicken the interest of the western counties in the declining fortunes of the king. This attachment to the fallen dynasty was not likely to go unpunished when one so vindictive as Edward IV. attained the supreme power; but Canynge "made his peace" by submitting to a fine of 3000 marks, or about £20,000 of present money. This exaction took place on Edward's coming to Bristol in 1461, when Sir Baldwin Fulford expiated his crime of the like loyalty to a lost cause by the headsman's axe.

It might have been thought that at the dissolution of the monasteries, when Benedictines, Austin Canons, Franciscans, Carmelites, and Dominicans, whose convents met the view everywhere within and without the church-crowned walls of the town, were turned out into the world to become as other men, there would have been an almost sudden expansion of commercial enterprise, religious inaction being exchanged for secular pursuits. It is strange to notice, however, that in the time of Elizabeth (1572), when a general registration was made of the shipping of the kingdom, the commerce of the (at that time) second city of the realm had gone backward. In that year the number of merchant ships attached to the port of Bristol was fifty three, of which the largest was of 110 tons, the aggregate tonnage being 1993. This was less than the tonnage of Canynge's vessels alone in the previous century. The fact seems the more surprising inasmuch as between these two epochs the Guild of Merchant Venturers had been established, and many remarkable voyages had taken place in connection with maritime discovery and commerce. Of these there had been none more memorable than the expedition of Sebastian Cabot (of Venetian parentage, but born in Bristol), who, leaving the rocky shores of the Avon in his ship the *Matthew*, sighted on 24th June, 1497, what he modestly called New-found Land, but which might have been more adequately named New-found World, for the discovery occurred a year before Columbus reached the American Continent. The commerce of the port had so much increased in the sixteenth century that in 1635 the citizens paid £25,000 for customs, while about the same time £6500 was charged them for ship money.

To come to more recent times, it is notorious that though the existence of such lines of steamers as the Bristol Steam Navigation Company and the Great Western Steamship Company shows that some of the old maritime spirit survives, the place has allowed itself to be eclipsed as a seaport by Liverpool and Cardiff, and shipbuilding is now a lost industry. This failure of energy is in spite of many special efforts to keep to the front in commercial enterprise. In the earlier part of this century a new channel, nearly 3 miles long, with two capacious basins, was excavated for the tidal Avon, the entire work of the floating dock, which covers an area of 82 acres, costing £600,000. Steam communication with Ireland was commenced at Bristol as early as 1826, and to the same port belongs the honour of being the first in the kingdom that instituted regular steam intercourse with the United States, the first voyage having been performed by the *Great Western* in 1838. This vessel, launched at Bristol 19th July, 1837, was of 1310 tons register, with engines of 410 horse power. She measured 212 feet in length, and cost £60,000. The time usually employed by sailing vessels in the outward and return voyages was thirty-six and twenty-four days respectively, but the *Great Western* reached New York in fifteen days and ten hours, the homeward trip taking only fourteen days. Instead of consuming 1480 tons of coal, which scientists declared to be necessary, she actually used only 450 tons. One hundred thousand people assembled at New York to witness her departure; and though only seven persons ventured out in her as passengers, she had sixty-eight on her return, together with 20,000 post office letters. Bristol, however, lost her opportunity of becoming

the great transatlantic steam harbour of England by attempting regular service with that one splendid ship alone, rivals in London and Liverpool soon effecting overpowering opposition with more numerous vessels. Another attempt for ascendancy was made by building the *Great Britain*, which colossal ship was launched at Bristol in the presence of Prince Albert, 19th July, 1843. Her total length was 322 feet, being the longest at that time afloat. Her measurement was 2981 tons; engines, 1000 horse power. Her screw propeller weighed 4 tons, she was rigged as a six-masted schooner, and cost £120,000. Unfortunately she would not pass the local locks, and was therefore detained from sea some months till these were widened. With yet greater misfortune, after a successful voyage, ten hours after leaving Liverpool again for New York (22nd September, 1846), the noble ship ran aground at Dundrum Bay, where she lay eleven months and four days, her passengers, about 198, the largest number that ever crossed in a steamer, being landed uninjured. Repaired and altered to a sailing ship she is still doing good service, but not with Bristol. The opening of the port and channel docks at Avonmouth, on the Gloucestershire side of the Avon, with the establishment of the Portishead docks on the Somerset side, have afforded convenient harbourage for unlimited shipping, while the connection of these harbours with the city by railway has saved the difficult passage of the rock-bound river. But the results do not show increasing trade. The lessened productive power of Bristol is partly owing to the collapse of the sugar-refining trade, which failure had in 1881 occasioned a reduction of 30,000 tons of shipping, as compared with 1876. The number of vessels registered as belonging to the port in 1885 was—sailing, 191 (31,821 tons); steamers, 63 (26,103 tons); total, 254 (60,924 tons). The entries in 1884 were 8812 (1,228,083 tons), and the clearances 8536 (1,222,116 tons). The customs revenue in 1881 was £912,199.

By the Municipal Corporations Reform Act (1835) the city of Bristol was extended to include within its boundaries the adjoining parish of Clifton, the out-parishes of St. James and St. Paul, and St. Philip and Jacob, with parts of the parishes of Bedminster and Westbury-on-Trym, by which the area included in the city was increased to 4879 acres, with a circuit of about 15 miles. It was divided for municipal purposes into ten wards, whose burgesses return to the town council forty-eight members, added to whom are sixteen aldermen, chosen by the council, which make up the total number of sixty-four members. The magistracy of the city is administered by about thirty acting justices of the peace, who are appointed by the lord chancellor from time to time on the recommendation of persons locally connected, the mayor for the time being acting as chief magistrate.

The cathedral, originally the church of the mitred abbey of Augustinian canons, comprises some of the best characteristics of Romanesque and Gothic construction from the days of its founder, Robert Fitzharding (progenitor of the noble family of Berkeley), 1142, to our own period, the nave being one of the most successful works of Mr. G. E. Street. The ancient remains chiefly consist of a choir of five bays of the decorated period, with a fine east window, a thirteenth century lady chapel, two projecting south chapels, named respectively after the Berkeley and Newton families, a noble tower of the fifteenth century, a highly-enriched Norman chapter house, with a singular columnar vestibule, and the original great gateway of the abbey in the same style, but supporting a sixteenth century dwelling-house. The transomed arches of the side aisles of the choir are the most noticeable speciality of the church, and these have been reproduced in the added nave, a work that has cost £50,000. Besides many remarkable sepulchral memorials of the barons of Berkeley and of the abbots of the monastery, are a tablet to Bishop Butler,

author of "The Analogy," an allegorical mural monument, carved by Bacon, to Steine's Eliza; an inscription to Lady Hasketh, the friend of Cowper; the famous lines, incised in marble, "Take, holy earth, all that my soul holds dear," &c., to the wife of the poet Mason; and two monuments by Chantrey. The tower of St. Stephen's (1150) is allowed to be one of the stateliest parish towers in England. It is 133 feet in height, and, from the absence of buttresses, seems to rank with Mr. Ruskin's ideal class of towers, in all of which he requires it to be a point of chief necessity that "they shall stand in their own strength, not by the help of buttresses nor artificial balancings on this side or on that." The Temple Church, so called from the original structure having belonged to the Knights Templars, who had here a cell, is a spacious and dignified building of the fifteenth century, and is remarkable for its leaning tower, which overhangs the base 5 feet. The Anglo-Norman nave of St. James', built by Robert, earl of Gloucester, who was buried in the chancel of that Benedictine church, also invites attention; nor should the fine crypts of St. Nicholas and of St. John the Baptist, the spire of which latter church stands over the only remaining gateway of the old city, be overlooked by the antiquary. St. Mark's, or the Mayor's Chapel, once the Priory Church of the Gault's Hospital, is an architectural gem, and must be seen to be understood. But the chief glory of the place is St. Mary Redcliffe, an edifice which in itself may almost be said to embody a style that Mr. Ruskin calls "the detected Perpendicular." At my rate that style may then be seen in its highest realized perfection, though in combination with many beautiful features of earlier periods. The stately pinnacles, particularly that on the north side, with its festooned and interwoven foliage, the pinnelled walls, long ranges of stained windows, the triple-arched transepts, flying buttresses, trefoiled parapet and mural pinnacles, the great tower and exquisitely proportioned spire, the long and lofty interior, with its avenues of clustered columns, which, bounding majestically aloft, ramify into the geometrical tracery of the vaulted roof and foliage at the intersections into no less than 1185 gilt bosses, carved with sprightly tracery, and no two alike, are attributes that, together with the Lady Chapel and undercroft, outfit the building to rank, both architecturally and in magnitude, with at least the second of any cathedrals of the land. In some modernizing elect still to be seen in a room over the famous north porch the erratic genius Thomas Chatterton found the MSS. that he told the world were the Rowley poems. Of all the men of his day, Chatterton was perhaps the one of the highest poetic inspiration; and though there has been as much depreciation of his intellect as of his moral character, his reputation as a poet may safely be referred to the estimate of such distinguished judges as Coleridge and Wordsworth, Scott and Byron, Keats and Shelley, and more lately of Dante G. Rossetti. The premature close of his career (in 1770, at the age of eighteen, was like the sudden breaking off of some "Malswimmer Night's Dream" at the end of the first act, before the drama is unfolded or the creation of the artist understood. For public worship there are in Bristol and the out-parishes 158 churches and chapels. Of these fifty-eight are Episcopalian, twenty-three Congregational, forty-five of the various orders of Methodism, eleven Baptist, and four Roman Catholic, to which latter body belong also eight convents. Besides these are the rooms of the Salvation Army. A census of attendances at religious services was taken by the proprietors of the *Western Daily Press* on Sunday, 30th October, 1881, when it was found that at the morning services in the churches and chapels of the various denominations there were 52,000 persons present, and at the evening services 61,500.

The leading public schools are the grammar school and Clifton College. The former, founded in 1532, had in the

course of three centuries fallen into decay, but was reorganized in 1812, at which time it passed from the mayor and corporation into the hands of the Municipal Charity Trustees. The institution has since risen to an eminent position among the public schools of the West of England, the honour boards which cover the walls of the great school room being filled with lists of distinctions won by its pupils, past and present, at Oxford and Cambridge. Clifton College was founded in 1860, and already ranks among our great schools. Over 700 boys there receive the education of gentlemen, including religious teaching in conformity with the doctrine of the Church of England. The terms are:—Tuition and school fees, £25 per annum; boarding fees, £72 per annum; or for boys under thirteen years of age, £60. The University College of Bristol originated in 1876 in the desire of the Bristol Medical School to provide for the scientific and higher technical training of those above the ordinary school age in the West of England and South Wales, on the lines of Owen's College, Manchester. The project attracted the co-operation of Balliol and New Colleges, Oxford, as also the Clothworkers' Company of London, the former bodies making condition that the studies should include ancient and modern literature, and the latter body engaging to provide instruction in the technical science of woollen cloth manufacture. The college has no endowments, but is sustained by the contributions of public-spirited citizens and others interested in the progress of education. A rectangular pile of buildings, with a wing in the Tudor-Gothic style, has been erected for the purposes of the college on the northern side of the city, adjacent to the grammar-school. A school board was first elected in 1871, and at present (1885) there are under its superintendence school accommodation for 34,000 children, the average attendance being 23,000. The population (1881) of the ancient city was 99,914, of the added districts 119,639, making a total of 206,553. Until 1885 Bristol returned two members to the House of Commons, but under the Redistribution of Seats Act passed in that year the former boundaries were extended by the incorporation of St. George, Horfield, St. Philip, and part of Redminster, making the total population 253,996. The borough was then divided into four wards, each of which returns one member. There are two daily newspapers published in Bristol—the *Bristol Times and Mirror* (Conservative), and the *Western Daily Free Press and Bristol Mercury* (Liberal).

The Exchange stands in 1743 by Wood of Bath, has a street front of the Corinthian order, and within a fine garth with colonades. The new Law Courts, built in 1870, are Tudor-Gothic in style. They incorporate interesting remains, consisting of an Anglo-Norman arcade, and some Renaissance chimney-pieces and Tudor windows, of the house in which Edward Clifton, the famous philanthropist of Bristol (born 2nd November, 1636), resided. The City Library, founded in 1613, was reopened with a new district branch in 1876 as a free public library by the 1875 Act. It contains a finely-carved chimney-piece by G. S. Gribb. The Bristol Museum and Library is housed in the college of its geological and palæontological collections, the latter including many specimens of corals. The Theatre is the largest in the West of England, seating 1,500 persons. The building is in the Victorian style, and occupies a commanding position.

Of the famous churches the chief are the Royal Infirmary and the General Hospital. The former of these institutions is worthy of praise except in respect to situation, which was provided a less sanitary days than our own to have been a great liability on the part of those who selected it. John Howard, who in 1787 saw the building in progress, remarked concerning its close and confined situation that it would be "a monument of the unskillfulness of the subscribers, or of their inattention to

what constitutes a healthy hospital." The institution expends between £13,000 and £14,000 yearly. Its wards contain 260 beds. The General Hospital, which contains 150 beds, is constructed on the newest principles, and contains every convenience for the working of such an establishment. It is supported by subscriptions and voluntary contributions.

Mr. Muller's Orphanage, Ashley Down, adjoining Bristol, is the largest boarding-school in England, and perhaps no other establishment on so extensive a scale is in existence for maintaining and educating poor children until they are fit to earn their own living. By gradual accretion the institution has grown to dimensions capable of accommodating over 2000 children, the actual number being about 2050. The five distinct buildings constituting the premises have cost £115,000, the whole of which sum has been supplied, together with the expense of maintaining the establishment since its foundation in 1835, without any money being asked for, no appeal being ever made either to the public or to private individuals for aid. Prayer, faith, and waiting on God are the only instrumentality by which Mr. Muller professes to work, and his success apparently justifies his sole dependence on these spiritual means.

The "Red Lodge," which stands on the site of part of the gardens of the Carmelite Friars, was built in 1590 by Sir John Young, whose monument is in Bristol Cathedral. The house was purchased some time in the present century by Dr. James Cowles Prichard, the eminent ethnologist, whose residence it became. In 1851 it was appropriated to its present purpose of a reformatory school for girls by the distinguished social reformer, Mary Carpenter. The drawing room is of a very splendid character, of carved enrichment. The oak-panelled walls, with the architrave and mantle-piece of the same material, are loaded with sculptures of figures, trophies, flowers, and heraldic devices. Some cellanage of the old convent exists, and there is a secret room in the house formed within the apparent thickness of the walls. The manner in which the house was obtained for its present purpose was in this wise:—"Dr. W. B. Carpenter, brother of Mary, was at one time tutor in the family of Lord Lovelace, who married Lord Byron's sole daughter, Ada. By this means the poet's widow made the acquaintance of Miss Carpenter, and as their views and feelings on the subject of juvenile reform were alike, the dowered princess seconded the efforts of the practical woman by purchasing the Red Lodge, which she presented to Mary Carpenter to enable her to carry out her design. The public are admitted on each Thursday afternoon to view the house and the working of the institution.

No vestige of mediæval architecture is discoverable in Clifton, and though the existence of a church there from the days of Henry II. is sufficient evidence of some population, yet we believe no relic of occupancy is to be found of any date between the departure of the Romans and the seventeenth century. The parish church was rebuilt in 1822, in the worst style of modern Gothic. Christ Church is a well-proportioned building, with a graceful spire, in the Early English style. All Saints' Church, near Clifton Down, is a structure of higher pretensions than any other church in the Bristol district. It cost £40,000, and is yet without a tower. The cathedral-like magnitude of the building is in keeping with the ponderous severity of its construction. The type is Continental, and was adopted by Mr. Street from a study of some large churches in which great breadth of nave is gained by the narrowing of the side aisles, the purpose of this arrangement being to afford an unbroken view of the altar from any position westward of the chancel. All the windows are of stained glass, and there is a sumptuously carved reredos by Redfern. The services are high ritual. The Victoria Rooms, for public meetings, balls, &c., is partly Grecian and partly Egyptian in style;

these modes being judiciously combined the structure has an imposing effect. The Fine Arts Academy is in the Venetian style. It contains some fine pictures of modern artists. In its connection is the Bristol School of Art. The suspension chain bridge over the Avon, whether considered for elegance of design or romantic situation, may fairly be considered one of the most effective pieces of modern civil engineering. It was opened on 7th December, 1860. The floor of the bridge is 215 feet above high water, and the distance from centre to centre of the piers is 702 feet. Clifton on her throne of rocks is now balanced by another Clifton on the summit of the hanging woods of Leigh, on the opposite or Somersetshire side of the Avon, which promises to spread into that county as does the original into Gloucestershire. The mean annual results of meteorological observations at Clifton, 228 feet above the sea, are:—Mean barometric pressure, 29.638 inches; mean temperature, 48.7°; mean daily range of temperature, 13.6°; probable highest temperature, 85.0°; probable lowest temperature, 16.4°; mean humidity (sat. 100), 83.1; mean rainfall, 32.191 inches; mean daily ozone scale (0–10), 4.6.

BRISTOL, a town in Rhode Island, in the United States, stands on a neck of land between Narragansett and Mount Hope Bays, 18 miles S.E. of Providence. It is the capital of its county, and a favourite summer resort. The English nearly destroyed it during the War of Independence. Population, 6028.

BRISTOL CHANNEL, an inlet of the Atlantic, terminating in the estuary of the Severn, and bounded outward by a line through Lundy Island, connecting St. Gowan's Head and Hartland Point. From its position and form, opening towards the direct advance of the great tidal undulation from the south-west, and narrowing upwards, the tide-wave rushes into it with great rapidity, and rises to an unusual height, generally from 30 to 50 feet—a bore being thus frequently experienced. At Chepstow the rise of tide at springs is often from 60 to 70 feet higher than that of any known place except the Bay of Fundy. The same cause produces an almost constant swell throughout the channel, even with comparatively light winds. The ports and bays upon it are Caernarthen, Swansea, Cardiff, and Newport on the N., and on the S. Barnstaple, Bridgewater, and Weston-super-Mare; Lundy is the only island. The channel receives the small rivers Taff, Towy, Llonghor, Tawe, Usk, Monnow, Wye, Severn, Avon, Yeal, Brue, Parret, Taw, and Torridge. Its length is about 80 miles, and its breadth from 5 miles at its narrowest part to 48 at its broadest. Its total coast-line is about 220 miles, and it receives a drainage of 11,000 square miles. It is the largest inlet of the United Kingdom.

BRITAIN is called *Britannia* by the Latin writers. Britannia may be a Latinized form of a Celtic word; and the Celtic *brit*, "painted," has been held to be its original, since Cæsar has told us that the Britons used the blue wood as a war paint, in a sort of tattoo seemingly. But this is highly improbable, because it implies that the Britons called themselves "the painted people;" and since all the neighbouring savages were painted also, this would have been no distinction. The probable derivation is from the circumstance of the islands being first known (long before Cæsar, in fact to the Greeks in their palmy days) as the tin islands, the *Cassiterides*, for they were the chief source of the valuable metal tin in ancient times. This name, as time went on, became limited to the Scilly Islands; and Britannia kept the name given to it by the Phœnicians, the explorers, navigators, and merchants of these distant times. *Barutanie* or *Brutanie* is Phœnician for "tin island;" and Aristotle, in speaking of the island, uses this instead of the pure Greek *Cassiterides*. This last fact almost settles the question of derivation. Against this it must be added that the Gaelic name for the island

is *Brythton*, and for the language *Brythoneg*. Another name, *Albion*, was given to the island by the Romans, who approached it by the chalk South Downs, with their white (*albus*) cliffs. The earliest inhabitants of Britain that we know were of that great family the main branches of which, distinguished by the designation of Celts, spread themselves so widely over middle and western Europe. The Celts crossed over from the neighbouring country of Gaul; and Welsh traditions speak of two colonies, one from the country since known as Gascony, and another from Armenia. At a later period the Belgæ sailed the south and east coasts of the island, and settled there, driving the Celts into the inland country. These Belgæ were a branch of the great Teutonic family. The British Celts were of the branch called *Cymry*. The Irish and Highlanders are Gaels, and were probably the first comers, afterwards driven onward by the Cymry. The Phœnicians kept their knowledge secret; and little more than the name of *Leutanie* was known till Pytheas a merchant of Massilia (Marseilles), a Greek colony in Southern Gaul, sailed round Britain in the time of Alexander the Great, about 330 B.C., and amongst other particulars mentioned its triangular shape.

The great Julius Cæsar, about 55 B.C., during his Gallic wars, being provoked, as he tells us, by the aid which had been furnished to the Veneti (the people of Vannes in Bretagne) and other maritime people of Western Gaul, determined upon the invasion of Britain. His description of the island and of its inhabitants, the earliest we have, is contained in the fifth book of his "Gallic War." The climate, he says, is more temperate than that of Gaul. The inhabitants of Cantium (Kent) were the most civilized, and did not differ much in their customs from the Gauls. The religion of the Britons was Druidism, which was considered by the Gauls to have originated in Britain. Cæsar's description of Druidism applies to Gaul; but it appears from his own remarks that what he says of it is equally applicable to Britain.

"They are the ministers of sacred things; they have the charge of sacrifices, both public and private. A great number of young men resort to them for the purpose of instruction in their system, and they are held in the highest reverence. Over all these Druids one presides, to whom they pay the highest regard of any among them. Upon his death, if there is any of the other Druids of superior worth he succeeds; if there are more than one who have equal claims a successor is appointed by the votes of the Druids, and the contest is sometimes decided by force of arms. These Druids hold a meeting at a certain time of the year in a consecrated spot in the country of the Carnutes (people in the neighbourhood of Chartres), which country is considered to be in the centre of all Gaul. Thither assemble all from every part, who are in Latin, Gaul, and submit themselves to their determination and sentence. The system of Druidism is thought to have been formed in Britain, and from thence carried over into Gaul; and now those who wish to be more accurately versed in it for the most part go thither (that is to Britain), in order to become acquainted with it. The Druids do not commonly engage in war, neither do they pay taxes like the rest of the community; they enjoy an exemption from military service, and freedom from all other public burdens. Induced by these advantages, many come of their own accord to be trained up among them, and others are sent by their parents or connections. They are said in this course of instruction to learn by heart a number of verses; and some accurately remain twenty years under tuition. Nor do the Druids think it right to commit their instruction to writing, although in most other things, in the accounts of the state and of individuals, the Greek characters are used. It is especially the object of the Druids to accustom the souls do not perish, but after death pass into other bodies; and they consider that by this belief more than

anything else men may be led to cast away the fear of death, and to become courageous." (Caesar, "Gallic War," book vi. chap. 13, &c.)

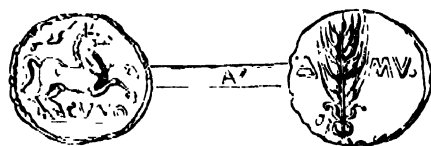
In the autumn of the year 55 B.C., Caesar, embarking with the infantry of two legions (about 8000 to 10,000 men) at the Portus Itius (probably Witsand, between Calais and Boulogne), arrived with part of his fleet, after a passage of about ten hours, on the coast of Britain, and beheld the steep cliffs which skirted the shore covered with armed natives ready to dispute his landing. Proceeding about 7 miles further, he disembarked (26th of August) on the open and level beach which presented itself to him. The place at which Caesar first touched was near the South Foreland, and he landed somewhere on the flat shore which extends from Walmer Castle towards Sandwich. He did not make good his landing without a severe struggle. But the season was late, and Caesar made apparently no progress on the island. Being anxious to return, he embarked with his legions, and increased number of boats, when he came intended to be brought to him on the Continent, for which he immediately embarked.

In the next year (54 B.C.) Caesar, embarking again at the Portus Itius, invaded the island with a much larger force. His fleet consisted of 800 vessels of all classes. He landed at the same place as on the former occasion, and setting out about midnight in pursuit of the natives, found them drawn up on the bank of a river, the Stour, to oppose his further progress. His cavalry drove them into the woods in the rear of their position, and one of his legions (the 7th) stormed a stronghold, famed of timber, which had been formerly constructed probably in some domestic war. Intimidated that his fleet had been damaged by a storm, obliged Caesar to recall his troops from the pursuit of the enemy, and his return to the coast, to ascertain the extent of the damage, and take measures for repairing it, delayed his operations for some days. Upon his return to his former position, he found that the natives had augmented their numbers in all parts, and had intrusted the command of the island to Caradoc (Carwallion), a prince whose territories were divided from the maritime tribes by the river Thames (the Chess), at a point which was 80 Roman miles from the Kentish coast. (This would be about 74 of our miles.) This prince had been engaged previously in wars with his neighbours, but the common danger compelled them to forego their disputes. After some successful successes and stratagems, Caradoc's followers dislodged the greater part of his forces, deterring about 4000 chariots, whose skill in the management of their chariots rendered them very formidable, and retired, as it appears, into his own domain, across the Thames. That river was fordable only in one place, in the line of Caesar's army, and the natives had planted stakes, sharpened at the point, on the bank and in the bed of the river. Caesar, crossing the river, put the enemy to flight, received the submission of several tribes, and took by storm the town of Camalodunum. These successes, combined with the capture of the prince of Cantium (Kent, and Surrey), led to a general attack upon the maritime camp where the Romans had formed to protect their fleet, induced Caradoc to submit. The conqueror demanded hostages, and a tribute to be paid by the subject Britons, and returned to Gaul with his forces and a number of captives.

The fleet of Caradoc, drawn up on the Stour to the Thames, cannot be supposed to have been at what place he crossed the river. He probably spent about two months in Britain, and then returned to Gaul.

The Romans did not return to Britain until the reign of Claudius, thus leaving the Britons independent for about a century. In the interval the Britons, who dwelt in the parts nearest to Gaul, appear to have made considerable progress in civilization. They coined money, and many British coins have been

discovered, of which about forty belong to the reign of Shakspeare's Cymbeline (Cunobelin), whose residence was at Camalodunum (either Colchester or Maldon), and whom we should therefore take to be a king of the Trinobantes, the people of that part of the country. The money of Cunobelin is supposed to have been the work of a Roman artist, or of some Gaul familiar with Roman customs. The subjoined engraving is from a coin, one of several of Cunobelin, in the British Museum.



Coin of Cunobelin—actual size (gold).

The Trinobantes took the lead in opposition to the invading force sent by the Emperor Claudius. Anlus Plantius, a senator of praetorian rank, commanded the forces which were designed for the attack on the island (A.D. 43). The Britons were defeated in two battles, in the first of which they were commanded by Caradoc, in the second by Togodumnus, the sons of the now deceased Cunobelin. After various encounters with the natives, Plantius awaited the arrival of the Emperor Claudius. Claudius embarked with reinforcements, including some elephants, and landing at Massilia (Marseilles) proceeded through Gaul to Britain. Upon his arrival he crossed the Thames with his army, defeated the natives who had assembled to oppose him, took Camalodunum, forced numbers of the Britons to submit, disarmed the vanquished tribes, and returned to Rome, leaving Plantius to secure the Roman conquests. The senate decreed triumphal honours to the emperor, and the memory of his victory has been perpetuated in his coinage.

During the command of Plantius his lieutenant Vespasian conquered the Isle of Wight. Upon the departure of Plantius those Britons who were struggling for independence overran the lands of such as had allied themselves with or submitted to the Romans; and P. Ostorius Scapula, who succeeded Plantius (A.D. 50) as praetor, on his arrival found affairs in great confusion. The seat of war was now transferred into the country of the Ordovices (North Wales and Shropshire) by Caradoc, who had become prince or at least commander of the Silures, the dominant people of South Wales. He posted his forces upon a steep ascent, and fortified the approaches by a rampart of loose stones; a river ran in front of his strong position, and his best troops took their station before the ramparts. But this strong position was stormed by the Roman troops; the wife and daughter of Caradoc were taken; his brothers surrendered themselves; and the gallant prince himself was put in chains by Carismandua, queen of the Brigantes, with whom he had taken refuge, and delivered up to the Romans. His noble demeanour when at Rome before Claudius commanded the admiration of that prince, and the emperor pardoned him. His defeat and capture probably took place A.D. 51. There seems some reason for believing that Claudius appointed Caradoc to govern part of Britain under the Romans. It is certain that he stood in good favour. "I wonder," said he, when he was led in triumph through Rome, "that you who have such splendid palaces should come and disturb me in my poor cottage in Britain." The insignia of a triumph were decreed to Ostorius; but his successes ended with the defeat of Caradoc. The Romans were harassed with repeated skirmishes and by the obstinate resistance of the Silures, and Ostorius died worn out with care (perhaps A.D. 53).

Dilus, the successor of Ostorius, found the Roman

affairs in a depressed condition, and he does not appear to have gained any signal advantage. His command lasted into the reign of Nero, the next emperor after Claudius, probably till A.D. 57. Veranius, the successor of Didius, lived only a year after undertaking the command, and did little. His successor, Paulinus Suetonius, attacked the island of Mona (Anglesey), transporting his infantry over the Menai Straits in flat-bottomed boats, the cavalry fording the passage, or in the deeper parts swimming. The description of this attack, which is highly characteristic of the people of the island, is given in the annals of Tacitus ("Annales," xiv. 30). From the shores of the extreme west Suetonius was recalled by the news of a great rising of the natives under the injured Boadicea, in that part of the island which had been already subdued by the Romans. [See BOADICEA.] After the defeat of the British Suetonius was recalled to Rome. Although several generals were successively sent to the island, the Romans made little progress until the time of Vespasian, A.D. 70-78, in whose reign Petilius Cerealis subdued the Brigantes, who under Venutius had renewed hostilities; and Julius Frontinus subdued the Silures. But no permanent additions were made to Roman dominion in Britain before the arrival of the great AGRICOLA. In

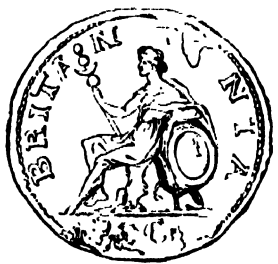
line of stations between the Forth and Clyde with a permanent fortification. See ANTONINUS, WALL OF.

In the following reign of M. Aurelius (A.D. 161 to 180) we have some notice of wars in Britain, which Calpurnius Agricola was sent to quell. Commodus, the successor of Aurelius, sent against the Caledonians his lieutenant Ulpius Marcellus, who defeated them with heavy loss. But the incursions of the Caledonians continued to be so frequent, and were of so fierce a nature, that the next great emperor, Septimius Severus, near the close of his reign, though growing old and infirm, himself crossed over into the island, A.D. 207. The natives offered to submit, but Severus dismissed their ambassadors. Two people, the Maatae, who dwelt nearest to the Roman wall, and the Caledonians, who were more remote, were the great objects of the emperor's hostility. These tribes wore little clothing, and painted or otherwise marked upon their bodies the figures of divers animals; a small target or shield, a spear, a poniard, and as we learn from Tacitus, a cumbersome unpainted sword, composed their offensive and defensive arms. They had neither walls nor towns, but lived in tents; a pastoral race, feeding upon milk and wild fruits, and the flesh of such animals as they took by hunting. It was during this war that Severus ordered the erection of the wall which stretches across the island from the Solway to near the mouth of the Tyne. The length of this wall, owing to the corruption of the text of ancient authors, is given with great diversity. It is probable that the true reading in each of them was LXXXII. or LXXXV. miles, which is rather more than the length assigned to Hadrian's rampart of turf, which was near this wall, and extended in the same direction. Remains of both these great works exist. The rampart of Severus, which is of stone, is for the most part, but not invariably, parallel to that of Hadrian; it lies to the north of it, and extends rather further at each end. It is accompanied throughout by a military road, or indeed by several military roads. Severus died at Eboracum (York) A.D. 211. He had carried his arms far north, and probably fixed the boundary of the empire at the rampart of Antoninus, though his erection of a wall so near to the rampart of Hadrian indicates that he thought the intermediate territory either of little value or of uncertain tenure. Soon after his death his son Caracalla surrendered a great part of this territory when he made peace with the Caledonians.

In the reign of Diocletian and Maximian, Carausius, a Menapius (the Menapians were a people of the Netherlands), who commanded the Roman fleet in the North Sea against the Frankish and Saxon pirates, seized Britain and assumed the purple (about A.D. 288); and such was his activity and power that the emperors consented to recognize him as their partner in the empire. He was, however, after some years killed by Allectus, one of his friends (A.D. 293), and three years afterwards Britain was recovered for the emperors by Asclepiodotus, captain of the guards. Upon the resignation of Diocletian and Maximian (A.D. 305) Britain was included in the dominions of Constantius Chlorus, one of their successors. This prince died at Eboracum A.D. 306, after an expedition against the Caledonians. His son Constantine was proclaimed emperor (he is best known as Constantine the Great), and carried on hostilities with the same people and the Maatae. The northern tribes now began to be known by the names of Picts and Scots. Britain, like the rest of the empire, gradually became Christian as the emperor adopted that religion. It had already had its first martyr, Alban the missionary, who was put to death at Verulamium (Verulam) in 304. In honour of him a monastery arose close by, in Saxon Christian times, which soon flourished so that, for the sake of the materials wherewith to build cottages under its shelter, the old Roman town was pulled down, and Verulam gave way to Saint Albans.



Medal of the Emperor Antoninus Pius in British Museum—
actual size (brass).



Reverse.

the article on this distinguished general we have pointed out his important work in the island. It may be considered that to Agricola we owe the permanent elements of Roman civilization. He completely subdued and brought to order the south of Britain (Britannia Romana), and thoroughly tamed the wild savages of the north, now called Britannia Barbara or Caledonia. The wild Celts who inhabited its crags and morasses were called Caledonians.

From the time of Agricola we read little about Britain in the Roman historians until the reign of Hadrian (A.D. 117 to 138), who visited all parts of his empire, and amongst them this island. The emperor fenced in the Roman territory by a rampart of turf, 80 Roman or about 71 English miles long. This rampart extended from the *Æstuarium Ituna*, Solway Frith, to the German Ocean, a little south of the more solid wall afterwards built by the Emperor Severus. In the succeeding reign Lollius Urbicus, lieutenant of Antoninus Pius in Britain, drove back the barbarians, and secured the country as far as Agricola's

The Roman power was now decaying, and the provinces were no longer secure against the irruptions of the savage tribes that pressed upon the long line of their frontier. Britain, situated at one extremity of the empire, suffered dreadfully. The northern tribes, Picts, Scots, and Attacotti, burst in from the north, and the Saxons infested the eastern and southern coasts. In the reign of Valentinian I. (361-375), Theodosius (father of the emperor of that name), being sent over as governor, found the northern people plundering Augusta (London). He drove them out, recovered the provincial towns and forts, and re-established the Roman power.

When Gratian and Valentinian II. associated with them in the empire Theodosius, son of the above, Maximus, a Spaniard who had served with great distinction in Britain, took umbrage at the preference shown to another, and raised in the island the standard of revolt, A.D. 383. Levying a considerable force he proceeded to the Continent, defeated Gratian, whom he ordered to be put to death, and maintained himself for some time in the possession of his usurped authority. He was, however, at last overcome by Theodosius, and the province returned to its subjection to the empire. The Britons who had followed Maximus into the Continent received from him possessions in Armorica, where they had the foundation of a state which still retains their name Brittany. The Cymry in Armorica were joined by such numbers of their fellow countrymen, when the English invasion began in earnest, that the country was called Britain (*Britannia*), and thus it was that the elder Britain came to be called for distinction GRÆVE BRITAIN (*Britannia Magna*).

Stilicho, whose name is one of the most eminent in the degenerate age in which he lived, served in Britain with success, probably about A.D. 403; but the time and particulars of his service are not known. The unhappy province after its departure was again attacked by barbarians, and agitated by the contentiousness of the Roman soldiery, who successively set up three claimants to the imperial throne in the reign of Arcadius and Honorius. Marcellus, a second Gratian, and a second Constantine. The two first were soon obtained and destroyed by the very power which had raised them. Constantine was for a time more fortunate. Raising a force among the youth of the island he passed over into Gaul (A.D. 407), acquired possession of that province and of Spain, and fixed the seat of his government at Arles, where he was taken and killed in 411 by Constantius, the general of the Emperor Honorius. His expedition served to exhaust Britain's defenders, the distresses of the empire rendered the withdrawal of the Roman troops necessary, and about A.D. 420, nearly 500 years after the first vision by Julius Cæsar, the island was abandoned by them.

The first Roman governors of Britain were the proper officers of the empire, chiefly or entirely military; for as there is no known, any records or traces of the subdivision of Britain into a comparatively later period of the Roman empire. The extensive and important changes introduced into the Roman government by Diocletian affected Britain. The whole empire was divided into four great portions, and Britain was included in the province of Gaul. From the "Notitia Imperii" we learn that the government of the island was entrusted to an officer called *Valens*. Under his name there were five governors, who were set over the following provinces:

Britannia Prima, the country south of the Thames and the Trent; *Britannia Secunda*, the country separated from the rest of Britain by the Severn and the *Flavia Caesariensis*, the territory north of the Thames, east of the Severn, and south of the Mersey and the Humber; *Maxima Caesariensis*, the country from the Mersey and the Humber to the wall of Severus; *Valentia* (so called in honour of the Emperor Valentinian I. by Theodosius, when he re-conquered the district in 367), the country between the wall

of Severus and the rampart of Antoninus, including the south part of Scotland, Northumberland, and part of Cumberland. The remaining part of the island was never long in the power of the Romans.

There were ten cities *Latia jure donata*; that is, the inhabitants had that status and condition which the Roman jurists indicate by *Latinitas* or *Jus Latii*, by virtue of which they had all the capacities of Roman citizens as to property and testamentary bequests, but not the capacity to contract a Roman marriage. There were twelve towns called *Stipendiariae*, with whose constitution and privileges we are not acquainted.

The strong walled cities, either founded by the Romans or built on the sites of British towns, such as Carlisle, Caerwent, Cirencester (Lat. *castra*, pl. "a camp"), Leicester, Silchester, Burgh Castle, Richborough Castle, and others, of which great remains still exist, sufficiently indicate that the possession of the island was considered insecure without these strongholds, while they show that the formation of large towns, the centres of civilization, was a part of the Roman system. Carlisle, York, and London were the three archbishoprics of Roman Christian Britain. Towns served as stations of the military force required to keep a given district in order, to enforce the payment of taxes, and generally to provide for the defence of the island. Many of these walled towns were evidently built with a view to trade, both foreign and internal; they would form the great markets, and would, of course, contain the courts of justice. These towns, under the names of *Municipia*, *Coloniae*, &c., received institutions similar to the towns of Italy, Gaul, and Spain; and thus the Romanized inhabitants of Britain were probably introduced under their foreign masters to the rudiments of this important branch of political science, the construction and administration of municipalities. The Saxons, we know, ultimately possessed themselves of all the Roman walled cities, of which they formed their boroughs [see *MUNICIPAL CORPORATIONS*]; and it is hardly conceivable that a comparatively small body of invaders would completely overturn all those municipal institutions, which would present them, so far as administration was concerned, with useful means for consolidating their acquisitions. In all probability they abandoned their own polity in great part in favour of the excellent Roman administration, which, although now in decay, still showed its superiority to any existing mode of government.

A map of Roman Britain (*Britannia Antiqua*) is prefixed to this volume, each Roman name having its English equivalent.

BRITAIN, GREAT. See GREAT BRITAIN.

BRITANNIA METAL, a metallic alloy of a white silvery colour which is largely used for making cheap tea and coffee pots, tea-spoons, hot-water jugs, &c. It is composed of tin, antimony, zinc, and copper, the proportions of which are varied according to the quality required. Generally it consists of about $\frac{8}{10}$ parts of tin, $\frac{1}{10}$ of antimony, $\frac{1}{10}$ of zinc, and $\frac{1}{10}$ of copper. Another form of this alloy, known as queen's metal, is made up of 9 parts of tin, 1 of antimony, 1 of bismuth, and 1 of lead. It is harder than pewter, but is softer than ordinary Britannia metal.

BRITANNICUS, the son of the Emperor Claudius by the notorious Messalina, his third wife, was born A.D. 42, soon after Claudius' succession to the throne, and was named Britannicus in commemoration of the emperor's conquests in Britain. [See BRITAIN.] The youth was, therefore, the Caesar or heir to the empire. But when Messalina had been executed for her crimes, the equally notorious AGRIPPINA, daughter of the spotless Agrippina the Elder, succeeded in inducing her uncle Claudius to marry her. She had already a son by a former marriage, Lucius Domitius Ahenobarbus; and she was successful in getting him adopted by the emperor (A.D. 50), under the name of Nero

Claudius Caesar Drusus Germanicus. He was five years older than Britannicus. Claudius gave him his daughter in marriage, and eventually went so far, under the pressure of Agrippina, as to disinherit Britannicus in his favour. Perhaps, as the empire was not yet hereditary, but merely confined to the Cæsars by birth or adoption, it is too much to say that Britannicus was disinherited; at all events Nero was proclaimed Cæsar, and the future successor to the empire, A.D. 53.

Agrippina was one of the most abandoned women who ever lived; her own brother (Caligula) had banished her for her licentiousness, and now that she had converted Nero into a Cæsar and the son-in-law of a Cæsar, the emperor, her husband-uncle, was of no further use to her, and in the next year she poisoned him. Nero came to the blood-stained throne as a lad of eighteen, and in the following year, A.D. 55, quarrelled with his mother, who had up till then been ruling in his name. Agrippina threatened to avail herself of the popular affection and pity for Britannicus, and restore him to his heritage against her unruly son. Nero, therefore, invited all the family to a grand banquet, and poor Britannicus fell poisoned at the table, in the presence of his own sister Octavia, wife of the tyrant. Agrippina also was of the company; her own murder, by orders of Nero, came four years later.

BRITISH AMERICA. The territory comprehended under this name is bounded E. by the Atlantic, Davis Strait, and Baffin's Bay; N. by the Arctic Ocean; N.W. by Alaska; W. by the Pacific; and S. by the United States. The southern boundary, which had long been a matter of dispute, was definitely settled by the conventions of 1859 and 1846. From the Atlantic it enters the river St. Croix in Passamaquoddy Bay, in 45° 10' N. lat., and 67° 15' W. lon.; it follows the course of the St. Croix to its source; proceeding thence from a monument erected at the source, it runs N. in a straight line till it meets the river St. John, then up along the mid-channel of that river to the mouth of the St. Francis; up the St. Francis to the outlet of the Lake Tohenagameck; it then curves round the north-eastern edge of the basin to Hull's Stream, one of the head-waters of the Connecticut; down the mid-channel of that stream to a line surveyed and marked in 1774 as 45° N. lat.; along that line W. to the St. Lawrence; thence along the middle of that river and of the Lakes Ontario, Erie, Huron, and Superior, to Fort Charlotte in 48° N. lat.; thence by Saginaw, Sturgeon, and Rainy Lakes, to the N.W. point of the Lake of the Woods; thence by a line due south to 49° N. lat., and along this parallel till it strikes the De Fuca Straits; thence through the Haro Channel to the Pacific. Discovery is traced under AMERICA, and all other particulars under CANADA, DOMINION OF; BRITISH COLUMBIA, NEW BRUNSWICK, NOVA SCOTIA, NEWFOUNDLAND, PRINCE EDWARD'S ISLE, NORTH-WEST TERRITORY, MANITOBA, HUDSON'S BAY, and VANCOUVER ISLAND.

BRITISH ARMY. See ARMY, BRITISH.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, is an association of men eminent in the different departments of science, which has for its objects the rendering of assistance towards scientific research, and the publication of its results throughout the country. Many eminent men were concerned in its origin, but the chief honour must be given to Sir David Brewster, who first conceived the idea of such a society, and through whose exertions the first meeting was held at York in 1831. At this meeting the laws and regulations of the association were decided, its members were divided into sections, the subjects on which reports were to be read were selected, and the place of meeting (Oxford) was chosen for the ensuing year. Since then it has continued to increase in usefulness and in the extent of its influence, its proceedings being followed with interest throughout the whole

country. Its sections embrace the whole domain of science as it is at present, and are divided as follows:—Section A, mathematical and physical science; B, chemistry; C, geology; D, zoology and botany, including physiology; E, geography and ethnology; F, economic science and statistics; G, mechanical science and engineering.

Its meetings are held yearly, and at them close the town at which the next meeting is to be held is selected, and the president is chosen for the ensuing year. The latter was formerly expected in his inaugural address to present a survey of the chief scientific features of the preceding year, but of late years several of the presidents have chosen rather to confine themselves to that branch of science which has formed the chief subject of their studies. The address has now become one of the chief events of the year. It is reported more or less completely by the chief daily papers, receives the attention of numerous magazines and reviews, and generally, for some time after its delivery, forms one of the staple subjects of conversation in scientific circles. The money raised by the annual subscription of the members is carefully expended in aid of experiments and observations; and the proceedings of the association form a very valuable collection of scientific papers.

BRITISH ARMY. See ARMY, BRITISH.

BRITISH BURMAH. See BURMA.

BRITISH CHANNEL. See ENGLISH CHANNEL.

BRITISH COLUMBIA, a colony of British North America, occupying the north-west section of the continent, and bounded to the N. by the 60th parallel, W. by Alaska territory, S. by the 49th parallel or international boundary, and E. by the Rocky Mountains. Including Vancouver and Queen Charlotte Island, and the vast water-latch connected therewith, it may be said to embrace the whole country situated between the Salmon River on the north, and Puget Sound and the Columbia River on the south—an area of 320,000 square miles, or three times the extent of Great Britain. Until 1858 the whole region, including Vancouver Island, was held by the Hudson's Bay Company, under lease from the British crown. In that year the two colonies of British Columbia and the northern region, called Vancouver Island, were formed. These two colonies were amalgamated into one colony in 1867, and in 1871 became confederated as a province of the Canadian Dominion.

The Rocky Mountains, forming the eastern boundary, extend from south-east to north-west from 40 to 100 miles broad, rising in some parts to a height of 16,000 feet. The passes across these are high and difficult. The country between the mountains and the ocean, 100 miles broad, is traversed by the two parallel Coast and Cascade ranges. The former commences above N. W. Washington, and extends as far as Mount St. Elias to the north extremity. The Cascade range, so called from the cascades or rapids upon the Lower Columbia, commences on the northward of the California Sierra Nevada Mountains. The Fraser River flows from north to south nearly through the centre of the mainland of the colony, and at Lytton it is joined by the Thompson River from the north-east, and the Chilcotin from the north-west. These, with the Skeena, Fraser, Simpson, and Stikine, which find their way down to the Western Ocean, are the chief rivers of the colony. Between the ranges are numerous wide grassy plains, more than half the area is covered with one of the best forest-groves in the world. For hundreds of miles the whole surface of the country is densely wooded with firs, pines, the height of which frequently exceeds 100 feet; clothing the sides and slopes of the mountains with perpetual green. On the lower levels the climate is milder than that of Canada, and on the islands and coast region it closely resembles that of England, with the east winds. In the higher levels, however, the climate is severe; frost and snow reign there for half the year, and the summer climate is very variable.

The main mass of Vancouver Island is a mountain ridge, the highest peak of which, Mount Arrowsmith, rises to the height of nearly 6000 feet, and whose buttress-like walls descend, for the most part, abruptly to the shore. The island is 278 miles in length, with an average breadth of about 15 miles, and contains about 16,000 square miles. It is not an agricultural country, but abounds in wood, coal, and iron, and in consequence possesses great manufacturing advantages. It is, moreover, a natural tourist ground, and abounds in good roads, has a most picturesque coast, is well wooded, and friendly mountains inland, and, with a delightful climate, has abundant facilities for communication, sight-seeing, and pleasure-taking. Victoria, on the south-east coast of the island, is the capital town of the colony and the seaport of the island. Population, 8000. Vancouver has several other good harbours, particularly Esquimalt (pronounced *Squaino*) on the south, which is the best on the coast north of the famous Golden Gate of California; and Nanaimo, on the east, 65 miles from Victoria, the centre of the coal industry of the province.

New Westminster, the second city of the colony in population and trade, is picturesquely situated on the main land, on the right bank of the Fraser, 15 miles from the sea, and 75 from Victoria. The Fraser is navigable to this point for large vessels, and smaller river steamers can pass upward for 178 miles to Fort Hope.

The colony owes its importance mainly to the discovery of gold along the banks of the Fraser River in 1858, and to the extensive coal-mines of Vancouver Island. The annual yield of gold has averaged about £120,000. Next to gold and coal, timber, fish, furs, and hides form the most valuable articles of British Columbian produce and export. The splendid forests of the colony afford inexhaustible resources of most useful timber, and the fisheries promise to become wonderfully prosperous in time, so long as there is not a bay, inlet, head, or river in the colony that does not brim to the top with fish. Salmon are so plentiful in the Fraser that fish weighing 30 lbs. have been sold for 6d. Large establishments for the "canning" of fish are in successful operation on the Fraser, Columbia, Skeena, and other rivers. Vegetables and fruit of almost every kind popular in England are raised to perfection in the lower levels. The wild animals of the country comprise the bear, badger, marten, and red deer; geese, wild ducks, grouse, snipe, and ptarmigan.

The distance of the colony from any considerable centres of population is a serious hindrance to the various industries becoming largely profitable. One of the conditions, however, on which British Columbia entered the Canadian Dominion was the construction of the Canadian Pacific Railway. After some delay, this great undertaking was set about in earnest, and the line was completed and opened for traffic in 1885. Port Moody, near the entrance of Burrard Inlet, a few miles from New Westminster, is the chief coal terminus. Very great benefit to the colony is constantly expected to result.

The Queen Charlotte and other adjacent islands off the north coast of British Columbia are incorporated with it, but have few permanent white settlers. They abound with a most fertile and splendid landscape, and are said to be rich in copper ore. Attempts to work it have been rendered impracticable by the unstable character of the workmen employed and collisions with the native Indians, who are of a very low type. The population of British Columbia, according to the census of 1881, was 19,559, including 29,503 males and 19,956 females.

BRITISH HONDURAS, BELIZE, or BALIZE, is bounded N. by Yucatán, W. by a line drawn from the rapids of Gracias a Dios on the San Juan River, to Garbutt's Falls on the river Belize, S. by Guatemala, and E. by Honduras Bay and the Gulf of Mexico. The area is about 19,000 square miles, and the population in 1873 was

27,152. The word Balize, according to some authorities, is a corrupt spelling of Waliz, the name given to this spot by the Spaniards in consequence of the harbour and river having been discovered and much resorted to by a piratical Englishman named Wallace. Others, however, derive it from the French *balise*, a beacon.

The first settlement of British Honduras is uncertain, as the early visitors were merely the mahogany and logwood cutters, whose residences were but temporary. The first establishment of the English in this quarter was made shortly after the treaty with Spain in 1667. The first settlers were adventurers from Jamaica, who fixed themselves at Cape Catoche, and gradually extended their location to the town of Belize. Great hostility was shown to this settlement by the Spaniards residing in and about Campeche, and after many struggles between the settlers and the Spaniards, the right of the British to maintain a settlement in this place was recognized by the crown of Spain in a treaty concluded in July, 1670. During subsequent wars with Spain the British settlers were more than once dispossessed; but the treaty of 1763 put them once more in possession, which, with the exception of an unsuccessful attack by the Spaniards in 1798, has since been undisturbed.

The neighbourhood of the town of Belize abounds in lakes and swamps, which are overflowed during the rains. The intercourse with the interior by land is difficult, and travelling is most conveniently performed by the river. The commerce of British Honduras consists chiefly in the exportation of mahogany and other woods and sugar, the cane growing in luxuriant abundance in the rich soil of the valleys and plains. Felling the trees in the mahogany forests, trimming the trunks, and conveying them to the rivers, are the occupations of the dry season, from February to the close of May. Turtle abound, and among the wild animals are the fur beaver, the ounce, panther, tapir, deer, and opossum. The rains begin to descend in June, when the timber is drifted down by powerful currents, but prevented from going out to sea by strong booms across the outlets. The climate of British Honduras is generally moist, but is considered healthy; the place is constantly refreshed by the sea-breeze (except for a few months) tempering the heat, which, however, is not excessive, as the thermometer seldom rises above 83° in the hottest time, and during the wet season sinks to 60°. The variation of temperature during the twenty-four hours is very great, frequently 25°. Maize, rice, yams, and plantains are cultivated for the consumption of the inhabitants; and a considerable number of horned cattle are bred, and employed in the mahogany works.

The principal rivers are the Belize, Hondo, and Sarstoon. The river Belize takes its rise in the mountains about 100 miles direct from the sea-shore. Its course is E.N.E., but very tortuous, and it is said to be navigable for 290 miles inland. It discharges itself into the Bay of Honduras by two mouths, one at the town, the other about 3½ miles to the north-west; the latter is, however, not accessible. The falls in different parts of the river and the scenery along the banks are extremely grand. The town of Belize is its capital.

The annual value of the imports is about £180,000, of which £120,000 is from Great Britain, and £40,000 from the United States. The exports amount to £210,000 per annum. The chief articles are sugar, mahogany, and log-wood.

The so-called representative assembly, by which the colony had been so long governed, having become quite useless, in 1871 a new constitution was introduced, which in all essential respects is assimilated to the form prevailing in what are termed crown colonies. The connection between the church and the state in the colony was finally severed in 1873.

BRITISH MUSEUM. The establishment of a national museum was suggested by the will of Sir Hans Sloane, who during a long period of eminent practice in physic had accumulated, in addition to a numerous library of books and MSS., a large collection of objects of natural history and works of art; these he directed should be offered after his death, which took place in 1753, to the British Parliament for the sum of £20,000, the collection having cost him £50,000. The offer was accepted.

But the attention of the legislature was not confined to the museum of Sir Hans Sloane. The Act of Parliament of the 26th Geo. II., which directed the purchase of his museum, also directed the purchase of the Harleian collection of MSS., and enacted that the Cottonian library of MSS., which had been given to the government for public use by an Act of the 12th and 13th of William III., should, with the library of Major Arthur Edwards attached to it, form a part of the general collection.

To defray the expenses of these purchases, to procure a fit repository for their preservation, and to provide a fund for the permanent support of the establishment when formed, the Act directed that £100,000 should be raised by way of lottery, the net produce of which, together with the several collections, was to be vested in an incorporated body of persons, selected from the first characters in the kingdom for rank, station, and literary attainments, upon whom it conferred ample powers for the disposal, preservation, and management of the institution, which it was determined should bear the name of the British Museum.

The only buildings offered as general repositories at this time were Buckingham House, with the gardens and field, for £30,000; and Montague House for £10,000. The latter was finally fixed upon, and the agreement for it made in the spring of 1754. The architect employed was Peter Pugot, a native of Marseilles, who was assisted in the decorations by Charles de la Fosse, Jacques Rousseau, and Jean Baptiste Monoyer, three artists of great eminence. The Harleian collection of MSS. was removed to it in 1755, followed in 1756 by the other collections; and the whole having been properly distributed and arranged, the museum was opened for study and public inspection 15th January, 1759. Additions were continually made; they were constantly enlarging; and at length the contents became too large for the original edifice, and in 1823 a new building was resolved on, which was designed by Sir Thomas Smirke, and completed in 1817.

The buildings forming the new British Museum are arranged in a hollow square, facing the cardinal points of the compass. The southern or Russell Street front is the principal one, and presents to view an imposing columnar facade of the Ionic order. In the centre is a portico formed of a double range of columns, eight in each range; on each side of this is a smaller range of three columns; and at the east and west angles are projecting wings, also surrounded by columns; so that the columns of the whole front are upwards of forty in number. At the extreme west end is a detached building, and another one at the east end, which are the dwelling-houses and offices for the librarians and chief officers of the establishment. Including these houses this face of the museum is 570 feet in length. The inner quadrangle, which measures about 320 feet by 240, is, with the exception of a space of 28 feet all round, occupied by the magnificent reading room of the museum. This, which forms one of the chief architectural features of the building, was originally suggested by Thomas Watts, whose plans, greatly improved by Sir A. Panizzi, were carried out by Mr. Sidney Smirke. The first grant of money for its erection was voted by Parliament in 1854; and the building, which cost about £150,000, was opened in 1857. The interior is circular, and is crowned with a dome of the most noble dimensions, being 140 feet in diameter and 106 feet high. This room contains 1,250,000

cubic feet of space; its "suburbs," or surrounding libraries, 750,000. The building is constructed principally of iron, with brick arches between the main ribs, supported by twenty iron piers, having a sectional area of 10 superficial feet to each, including the brick casing, or 200 feet in all. This saving of space by the use of iron is remarkable, the piers of support on which the dome rests thus occupying only 200 feet, whereas the piers of the Pantheon of Rome (which it most nearly resembles, being but 2 feet less in diameter) fill 7477 feet of area, and those of the tomb of Mohammed 5593. The roof is formed into two separate spherical and concentric air chambers, extending over the whole surface: one between the external covering and brick vaulting—the object being the equalization of temperature during extreme heat and cold out of doors; the other chamber, between the brick vaulting and the internal visible surface, being intended to carry off the vitiated air from the reading-room. In order to obviate the effects of condensation all the skylights, lanterns, and windows throughout the building are double, the quantity of glass used amounting to about 60,000 superficial feet.

For convenience of access to the galleries the staircases have been placed so that throughout the building they are within 10 feet of each other. The museum contains 3 linear miles of book cases, 8 feet high; assuming them all to be spaced for the average octavo book size, the entire ranges form 25 miles of shelves. Supposing all these to be filled with books of paper of average thickness, the leaves placed edge to edge would extend about 25,000 miles, or more than three times the diameter of the globe!

The readers' tables are thirty-two in number; they are of various lengths, and accommodate altogether a vast number of persons. Two are set apart for the exclusive use of ladies. Each reader has allotted to him a space of 4 feet 3 inches long; and to obtain as much privacy as possible, he is screened from the opposite occupant of his table by a longitudinal division, which is fitted with a hinged desk, graduated on sloping racks, and a folding shelf for spare books. In the space between the two, which is recessed, an inkstand is fixed, having suitable penholders. The shelves within the room contain about 80,000 volumes. Of these about 20,000 consist of carefully-selected books of reference, to which the readers are permitted free access without the intervention of an official. To assist consultation they are distinguished by the employment of different colours in the binding, as blue for theology, green for philosophy, &c., and these colours correspond to those of the hand cut donees used for these works. The management of the reading-room is intrusted to a superintendent, who is also charged with the special duty of assisting readers in their researches, and whose desk is placed in the centre of the room. The catalogue tables are arranged round the superintendent's inclosure. In addition to the catalogues, these tables are furnished with printed tickets containing on one side the regulations to be observed by the readers in applying for and returning the manuscripts and printed books they desire to use, and on the other a form to be filled up with certain particulars relating to the works they seek for. The books are brought to the central inclosure, and thence conveyed by the reading-room attendants to the readers; the readers' tickets, filled up as above described, being then deposited in boxes constructed for the purpose within the superintendent's inclosure, and retained until the books they respectively describe have been returned, when the tickets are given up.

The reading-room is opened daily, with some exceptions as to stated periods for cleaning, the hours being from nine o'clock till four in November, December, January, and February; from nine till five in March, September, and October; and from nine till six in April, May, June, July, and August. The chief conditions to be observed by readers are—They must be at least twenty-one years of age, and must first make

an application to the principal librarian, accompanied with a recommendation as to character and eligibility. If the latter is considered satisfactory, permission is granted. It was formerly for only six months, at the expiration of which the privilege had to be renewed, but since 1879 this restriction has been withdrawn.

The contents of the British Museum were originally arranged in three divisions, viz. Printed Books, Manuscripts, and Objects of Natural History, the collection of antiquities being included in the latter. As time went on, and additional treasures were accumulated, fresh departments were created; and at the present period there are twelve of these, viz. Printed Books, Maps, Manuscripts, Prints and Drawings, Oriental Antiquities, Greek and Roman Antiquities, Coins and Medals, British and Medieval Antiquities and Ethnography, Zoology, Botany, Geology, and Mineralogy. The last four of these departments were placed under the superintendence of Professor Owen in 1856; and as there was no adequate space within the museum for the disposal of the various specimens belonging to them, the trustees resolved afterwards to erect a building to be devoted entirely to natural history. Part of the ground occupied by the International Exhibition of 1862 was procured for this purpose, and in 1873 Parliament voted £800,000 to commence the building. It is not yet (1884) completed; but a portion has been finished and part of the collections placed in position, these rooms being first opened to the public in 1882. Its internal arrangements have been carefully designed by Professor Owen, and when complete it will probably form the finest Museum of Natural History in the world.

To indicate even the principal treasures of this magnificent collection would be impossible in this work; but a brief notice of the contents of the various departments in the order enumerated is subjoined.

1. *Printed Books*.—This is the largest department of the museum, and it forms the largest collection of printed literature in the world. The nucleus of the library, a collection in the beginning of this century, consisted of the library of Sir Hans Sloane, 50,000 volumes, and that of Major Edwards, 2000 volumes. In 1757 George II. bequeathed to the museum the library of printed books collected by the kings of England from Henry VII. downwards, together with the libraries of Cotton and Cosin, and in addition bequeathed to the museum the right to a copy of every publication entered at Stationers' Hall. An important collection of French pamphlets was also presented by George III., and valuable gifts were made by private donors, among which may be mentioned Dr. Bentley, Sir J. Hawkes, Dr. Barrow, and Sir J. Banks. In 1823 George IV. presented the museum with the library collected by the father of a certain Frenchman, £200,000. By the terms of the gift this collection is kept separate from the rest of the library, occupying a separate place in the building, and is known as the King's Library. In 1816 another valuable collection, second only in importance to the King's Library, was bequeathed to the museum by the Right Hon. Thomas Grenville, consisting of 20,210 volumes, which had been purchased at a cost of over £41,000. In addition to these presents, and the enormous number of books received from the public, the important purchases have been continued to the present time, and there are now over 1,300,000 volumes preserved in the shelves of the museum, more than 300,000 being added every year. In this immense number of volumes are included specimens of the rarest and most valuable of books, and others executed in the earliest ages of printing, early editions of the classics, first editions of nearly all the famous English books, beautiful specimens of typography and illustration, are here to be found in an abundance of value to the most ardent bibliophile. Of some of the more famous books, copies preserving many editions are preserved. Thus, there are

over 120 editions of "Milton's Paradise Lost," and more than 100 each of the "Pilgrim's Progress" and "Robinson Crusoe," preserved in the museum, many of them being in foreign languages.

The catalogues of these books form a large library in themselves. The first was issued in seven octavo volumes in 1813-19. This was enlarged by interleaving for the new entries, until in 1846 it had expanded into eighty-two folio volumes. The whole of the books are now included in one general manuscript catalogue, which extends to more than 1600 folio volumes. In addition to this, and the hand catalogues before referred to, there are separate catalogues of the pamphlets in the King's Library, of the Grenville Library, of the Thomason collection of pamphlets, of music and of newspapers—the whole being so well designed that if the reader comes prepared with the name of his author he has little difficulty in ascertaining the number of the book he requires.

2. *Maps and Charts*.—These, with the plans and topographical drawings, were separated from the rest of the library in 1867. In this department, which is located in the basement, there are preserved over 50,000 published and over 20,000 manuscript maps, many of the latter being of great antiquity.

3. *Manuscripts*.—These are for the most part bound in volumes, and they include some of the choicest treasures of the museum. Of these may be enumerated the original Magna Charta; the "Dunham Book," a copy of the Latin Gospels with an interlinear Saxon Gloss, dating from 720; the "Basilicon Doron" of James I. in his own handwriting; a charter of William the Conqueror; a mortgage deed bearing the signature of William Shakspeare; and Milton's contract for the disposal of "Paradise Lost." It includes also the original manuscripts of many celebrated English works, and autograph letters in immense numbers of eminent persons of many ages and of different countries. Among the manuscripts of antiquity are to be found the world-famed "Codex Alexandrinus," a transcript on vellum of the whole Bible in uncial Greek (some small portions only being missing), which dates from the fifth century, and the earliest known manuscripts of the Iliad and Odyssey. It also includes an immense collection of early copies of the Greek and Latin classics, and of Syriac, Arabic, and Oriental documents. Some of these treasures are exhibited in glass cases for the inspection of the general public; and the right of using the reading-room also includes the right of consulting the manuscripts.

4. *Prints and Drawings*.—This forms the richest assemblage of etchings and engravings in Europe, though no purchases were made for this department until 1810. It is arranged in schools, viz. the Italian, German, Dutch, French, Spanish, and English, and it contains original drawings, etchings, and engravings of all the chief masters of these different nations. There are also many beautiful and famous works of art preserved in this department, among which are to be found a silver cup designed and carved by Benvenuto Cellini, and a carving in stone by Albrecht Dürer.

5. *Oriental Antiquities*.—Of these the earliest in point of date are the various monuments of ancient Egypt, which range over the period from the time of Abraham to the Mohammedan invasion of Egypt, 640 A.D. They include colossal statues of divinities and Pharaohs, sarcophagi, fresco paintings, mummy cases, obelisks, &c., many of which are inscribed with hieroglyphics, and the famous Rosetta stone which furnished the key to this method of writing. There are also valuable papyri taken from the mummy cases, containing portions of the Egyptian ritual of the dead; and an immense number of weapons, articles of dress, personal ornaments, tools, writing implements, ivories, bronzes, &c.

The Assyrian antiquities include the sculptures exca-

vated from Nimrud, Khorsabad, and Koyunjik, by Layard in 1847-50, and those acquired in the expeditions of Rassam, Loftus, and George Smith. Many of these are carved in relief with pictures, and inscribed with writing in the cuneiform character, affording the most interesting and valuable information as to the religion, art, literature, and manners and customs of the Assyrians and Babylonians. The earliest sculptures date from a period ranging from 930 B.C. to 747 B.C.; but there are smaller relics which belong to a period far more remote, and a collection of inscribed clay tablets containing some of the early history and primitive legends of these peoples. The latter, which were chiefly obtained by Mr. George Smith, on being deciphered were found to confirm in a striking manner the accuracy of some of the events recorded in the Old Testament. They also contain some curious legends relating to the Creation, Deluge, &c., bearing a strong resemblance to the accounts in the Book of Genesis. The collection also of ivories, bronzes, seals, glass, &c., is unrivalled for its extent and value.

6. *Greek and Roman Antiquities*.—These include the Elgin Marbles collected in Athens and Attica by the seventh Earl of Elgin in 1801-1803, and purchased from him in 1816 for £35,000. These, though sadly mutilated and defaced, still form the grandest known remains of ancient Greek sculpture, the most important being those which formed part of the decorations of the Parthenon. Second only in importance to these are the Phigalian Marbles, consisting of the frieze, &c., of the temple of Apollo; the figured columns from the temple of Diana at Ephesus, recovered 1863-75; and the sculptures from the Mausoleum or tomb erected to Mausolus by his wife Artemisia. Of sculptures of the Greek school, found chiefly in Italy, the commencement was formed by the acquisition of the Townley collection, purchased in 1805 for £20,000. To this has been added the collection bequeathed by Mr. Payne-Knight in 1824, numerous smaller bequests and donations, and a considerable number of purchases. Some of these, such as the Venus from Ostia, the Discobolus, Guistiniani Apollo, Clytie, Muses, Mercury, &c., have a world-wide reputation.

In addition to the sculptures there is a large collection of vases commonly known as Etruscan, numerous medics, terra-cottas, bronzes, and articles of domestic use, while the collection of engraved gems and ancient ornaments is unsurpassed throughout the world.

7. *Coins and Medals*.—The museum possesses an immense number of these, representing almost every age and nation. They are excellently arranged in chronological order, the divisions being into Greek, Roman, Mediæval, and modern, English and Oriental. The most valuable are the Roman and Anglo-Saxon collections.

8. *British and Mediæval Antiquities and Ethnography*.—In this are to be found the tools and weapons of the stone and bronze periods, Roman antiquities found in Britain, remains of the Anglo-Saxon period, early Christian lamps, crosses, mediæval carvings in ivory bells, enamel, pottery, and majolica. It also contains specimens of idols, fetiches, dresses, ornaments, and weapons of the savage races of the world, numerous antiquities and articles of modern use among Eastern nations, and a valuable and extensive assortment of Oriental arms, metal work, enamel, pottery, and glass.

9. *Zoological Department*.—This is made up of the collections of mammals, &c., acquired by Sir Hans Sloane; birds by Montagu, Hodgson, and A. R. Wallace; fishes by Yarrell; Antarctic specimens by Ross and Bekker; Indian animals by Hardwiche; and Chinese vertebrate animals by Reeves. In entomology there is the collection of Stephens, 88,000 specimens; the Saunders collection of beetles, 7267 specimens; and the entomological collections of Bowring and Clark, the latter consisting chiefly of coleoptera. It also includes the shells collected by Hugh Canning, which were acquired in 1866; and that of Mrs. J. E. Craig, comprising 12,000 specimens, presented in 1874. These

are only a few of the principal items of this colossal collection, which receives large additions, by purchase or gift, every year, often to the extent of several thousand specimens.

10. *Botanical Department*.—Of this the nucleus was formed by the herbarium of Sir Hans Sloane, consisting of 262 volumes, containing 8000 specimens. In 1820 the magnificent collection of Sir Joseph Banks was bequeathed to the museum; to these there has been added the accumulations of Robert Brown, Rev. R. Blight, Professor Nuttall, and many others, either bequeathed or acquired by purchase. To the various herbariums have been added specimens of woods and other vegetable structures, fungi, lichens, mosses, sea-weeds, ferns, grasses, sedges, flowering plants, parasitical plants, trees of all kinds, fruits and seeds, and also of fossil remains. To this department also large additions are continually made, the aim of its superintendents being to make it as completely representative of the science of botany as it is possible for a museum collection to become.

11. *Geology*.—This comprises the collections of Dr. Solander, Croizat, Mantell, Falconer, and many others, with large additions made by purchase, and includes fossil remains of plants and animals brought from all parts of the globe, with casts of many of the more famous specimens preserved in foreign museums.

12. *Mineralogy*.—The minerals are chiefly displayed in table cases, the larger specimens being placed upon stands along the sides of the rooms. They are arranged according to a chemical classification, and include diamond and gems of every variety, gold nuggets, crystals, metallic ores, &c., some of the specimens being unique and of great value. Among the most interesting features of this department is the large collection of meteorites, one of which, sometimes known as the Melbourne meteorite, but which was found at Cranbourne, Australia, weighs 3½ tons.

The government of the museum is vested under the Act of Parliament 26 Geo. III. and two or three other Acts, in forty-eight trustees, including twenty-three official trustees, nine family trustees, one royal trustee, and fifteen trustees who are elected by the other thirty-three. To obtain distinction has been called the "club of nobles of literature." The official trustees are the Archbishop of Canterbury, the lord chancellor, the speaker of the House of Commons, the lord president of the Council, the first lord of the Treasury, the lord privy seal, the first lord of the Admiralty, the lord steward, the lord chamberlain, the three principal secretaries of state, the Bishop of London, the chancellor of the Exchequer, the lord chief justice of the Queen's Bench, the master of the rolls, the lord chief justice of the Common Pleas, the attorney general, the solicitor general, the president of the Royal Society, the president of the Society of Antiquaries, and the president of the Royal Academy. Of the family trustees, two represent the Sloane, two the Cottonian, two the Harleian, one the Townley, one the Elgin, and one the Knight ranches, by whom they are respectively appointed. There is also a royal trustee, who is appointed by the crown.

Since 1879 the only restrictions as to the admission of the public to the museum have been, that on Wednesdays and Fridays the galleries of the Greek and Roman Antiquities are reserved for special students. With these exceptions the visitors are now admitted to all the public parts of the museum on every week-day. The only way for the general visitor, as distinguished from the special student, to enjoy the British Museum is to take it in detail, and to master its contents gradually. A hasty visit, or a general survey can only beget bewilderment and sorrow. As a great national collection, illustrating man and works, his history and his dwelling place, it is one of which Englishmen may well be proud.

From the accounts laid before Parliament, it appears that in the year ended 31st March, 1881, the total expenditure in connection with the museum amounted to

about £140,000, of which more than one-half went in salaries and incidentals, the other half in purchases, book-binding, and maintenance of the institution. The manner in which the institution is appreciated may be seen from the fact that, notwithstanding the attractions offered of late years by museums in other parts of London, such as South Kensington and Bethnal Green, the attendance is steadily maintained. The number of visitors to the ordinary collections averages half a million a year, and the number of readers in the reading-room now amounts to 120,000 per annum.

BRITISH NAVY. See NAVY.

BRIT TANY or **BRETAGNE**, one of the provinces into which France was divided before the Revolution, was bounded N. by the English Channel, W. and S.W. by the ocean and the Bay of Biscay, S. and E. by the provinces of Poitou, Anjou, Maine, and Normandie. Its coast-line, which is above 500 miles in length, and indented with numerous bays and harbours, extended from the mouth of the Gironde, on the confines of Normandie, to the mouth of the river Boulogne, which, flowing through the Lake of Grand-Benêt, falls into the Bay of Biscay opposite the Isle of Normandy, dividing Bretagne from Poitou. The greatest length of the province of Brittany, from S.E. to N.W., was 295 miles; its greatest breadth, at right angles to its length, 105 miles; and its area amounted to 15,085 square miles.

A long range of mountains, called *Ménez*, runs parallel to the northern coast, and terminates in the western part of the peninsula. The principal rivers of the province rise in this chain. Those which run N. into the English Channel have a short course; the chief of them are the Couesnon, before mentioned; the Rance, which falls in at St. Malo; and the Illeux, which enters the sea at Paimpol. To the south of the chain are the Anioe, called in the lower part of its course the river of Clévançon, which falls into the Channel of Bristol; the Blavet, which forms the harbour of Lorient, and enters the Bay of Biscay at Port-Louis; the Aulne, which, joined by the Ille and several smaller streams, enters the sea opposite Belle-Île, a little below Belle-Porte. The south of the province is traversed by the Loire. All these are tide rivers, and navigable.

The soil of the province is fertile along the coast, but a great part of the interior is covered with moor and heaths, and forests. Corn sufficient for the home consumption is grown. Very little wine is produced; the common beverage being cider. Flax and hemp are extensively cultivated. Leather, iron, tin, pyrites, and iron ore are found. Among the manufactures of Brittany, iron and silk both are the most important. The trade of harbours along the sea, and affords great facilities for carrying on important commerce, which consists principally of wine, brandy, fish, salt, cattle, butter, and the other industrial, mineral, and agricultural products of the province. The language of the inhabitants is a dialect of the ancient Celtic, corrupted, however, by a mixture of French words.

Britany was divided into Haute Bretagne and Basse Bretagne, the capitals of which were respectively Rennes and Nantes. Before the Revolution it had a local parliament or assembly of states. The states consisted, first, of the nobles, towns, merchants, and the gentry; secondly, of the clergy, who were represented by the heads of the several orders; and thirdly, of the *tiers état* or third estate, which was composed of the deputies returned by forty-one towns. The states met every second year at Rennes, Nantes, and St. Brieg alternately.

In the time of Julius Cæsar the territory of Brittany was included in the country occupied by the Celts, whose possessions extended between the Sequana (Seine), the ocean, and the Garumna (Garonne), and who spoke the same language as the ancient Britons. The general term

for a coast country in their language is said to have been *Ar Mor*, "on the sea;" from this the name *Armorien* was formed, which in the course of time came to be exclusively applied to the peninsula in the north-west of Gaul. The chief tribes who inhabited Armorica were the Veneti, a powerful maritime people, who made a gallant though ineffectual stand against the Romans under Julius Cæsar ("Bell. Gall." iii. 7-16), and whose name is retained in *Vannes*; the Osismii, who dwelt in the western part of the peninsula; the Redones, whose name appears in *Rédon* and *Rennes*; the Curiosolites, who occupied the present diocese of St. Brieg, and the Namnetes in the south, whose name remains in Nantes. Under the Roman empire Armorica formed part of Gallia Lugdunensis.

The name Brittany was applied to this part of France from the Britons who, driven from their homes on the invasion of Britain by the Angles, the Saxons, and other German tribes, emigrated hither in the fifth century, and formed a small independent kingdom. Brittany afterwards fell under the sway of the Franks, and was governed by sovereigns who had successively the title of kings, counts, and dukes. It was united to the other dominions of the kings of France in 1495, on the marriage of Anne, duchess of Bretagne, to Charles VIII. The province now forms the departments of ILLE-ET-VILAINE, CÔTES-DU-NORD, FINISTÈRE, MORBIHAN, and LOIRE INFÉRIEURE. The Bretons are very conservative. Paganism was still practised as late as the seventeenth century.

BRITTLE SILVER ORE or **STEPHANITE** is an important ore of silver, abundant in Chili, Peru, Mexico, and in the Comstock lode, Nevada; it is also found in some European localities. It is a sulphide of silver and antimony, containing 68 per cent. of silver and 15 per cent. of antimony. The hardness is about 2, and the specific gravity 5.5.

BRITTLE-STAR. See STAR-FISHES.

BRITTON FERRY, a town in the county of Glamorgan, Wales, on the Neath, 206 miles from London by the Great Western Railway. It has tin-plate and iron works. The population in 1881 was 5998.

BRIVE-LA-GAILLARDE, a town of France, department Corrèze, in a beautiful and fertile plain on the Corrèze, 15 miles S.W. of Tulle. The town is well built, the houses being all of hewn stone, and covered with slates. It has a considerable trade in wine, chestnuts, and cattle, and is the centre of the trade in truffles and *robailles* (truffles). The famous Cardinal Dubois was a native of Brive. Population, 12,160.

BRIXHAM, a small port, tributary to Dartmouth, in the county of Devon, is beautifully situated on the south side of Berry Head, about 7 miles south from Torquay, and 225 from London by the Great Western and South Devon Railways. The part near the sea is called Brixham Quay, or Lower Brixham, and consists of narrow and dirty streets. The upper part, called Church Town, is about a mile distant, and contains several good houses. The harbour has been somewhat improved by a breakwater. There are exports of iron ore—the brown hæmatite being found in large quantities in the vicinity—malt, and sheep. The prosperity of the town, however, depends chiefly on its fisheries, in which about 200 small vessels are employed. Large quantities of fish are sent to London, Bath, and Bristol, besides which much is salted and exported to the Mediterranean. Shipbuilding is also carried on rather extensively. William, prince of Orange, afterwards William III., landed at Brixham, 4th November, 1688. There is still current this address of the inhabitants as a welcome—

"And bless your Majesty, King William,
You be welcome to Brixham Quay,
To eat buckhorn and drink Bohem
Along with we;
And bless your Majesty, King William."

A "bone cave" was discovered at Brixham in 1858, in which many flint knives and other implements have been found, associated with the remains of extinct mammalia. The population of the parish of Brixham in 1881 was 7033.

BRIXTON, a precinct of Lambeth and metropolitan suburb, lies about $3\frac{1}{2}$ miles south of Blackfriars Bridge. The London, Chatham, and Dover, and South-western Railways traverse the district, and connect it with the city. The houses are of a superior description, and are surrounded by numerous trees and shrubs. At Brixton Hill are situated the female convict prison and the St. Ann's Society Asylum, for the support and education of children whose parents have been in prosperous circumstances.

BRIZA. See QUAKING GRASS.

BROACH (*Bharuch*), a district in Bombay, British India, lying between $21^{\circ} 26'$ and $22^{\circ} 17'$ N. lat., and between $72^{\circ} 32'$ and $73^{\circ} 11'$ E. lon. The area is 1158 square miles; and the population, 350,000.

The district forms an alluvial plain 51 miles in length, sloping gently westwards to the shores of the Gulf of Cambay (Khambhai), and varying in breadth from 20 to 40 miles. With the exception of a few hillocks of sand-drift along the line of coast, and some mounds in the neighbourhood of Broach city, the level of the plain is unbroken by any rising ground. The Mithi and Kun—the former a river of 300 miles in length, with a drainage area estimated at from 15,000 to 17,000 square miles, and the latter with a course of 70 miles and a drainage area of about 700 square miles—form respectively the northern and southern boundaries of the district. The surface of the plain consists, over almost its entire area, of black cotton soil, highly fertile and well cultivated. The domestic animals are cows, buffaloes, oxen, camels, horses, asses, sheep, and goats. The cattle are of two breeds—the small indigenous bullock and the large ox of Northern Guzerat. Well-to-do cultivators pay much attention to the appearance and condition of their bullocks. Cultivation is too general to allow much scope for wild animals; only the hog, wolf, and antelope are found. On birds the chief are the florican, sand grouse, partridge, quail, duck, snipe, and crane. The district is well supplied with fish.

Of the whole population 20 per cent. live in towns containing more than 5000 inhabitants. The villages have in general a thriving appearance, arising from the common use of tiles for the house instead of thatch; and the trees with which the villages are surrounded contribute to give a pleasing effect. There are two harvests in the year, (1) the early or kharif, and (2) the late or rabi. The early crops are sown in June, and except cotton, which is seldom ready for picking before February, are harvested in October and November. The late crops are sown in October and reaped in February.

The district is as healthy as any part of Guzerat, and the climate is much more pleasant than in those parts of the province situated further from the sea. The latter days of March and the month of April are the hottest seasons in the year. At the end of April west and south-west winds begin to blow, and continue till October, when the rainy season comes to a close. In the following months slight easterly winds prevail, which last till the end of December.

BROACH, the chief town of the above district, is situated on the right bank of the Narbada (Narbadi) River, about 20 miles from its mouth. Seen from the southern bank of the Narbada, or approached by the railway bridge from the south, the massive stone wall, rising from the waters' edge, and the buildings standing out from the high-ground behind, give the town of Broach a marked and picturesque appearance. Within the walls the streets are narrow, and in some places steep. The houses are generally two stories high, with walls of brick and tiled roofs. In the suburbs the

houses have a meaner appearance, many of them being not more than one story high, with walls of wattle and daub.

Broach is one of the oldest seaports in Western India. Eighteen hundred years ago it was one of the chief seats of the trade then carried on between India and the ports of Western Asia. In more recent times, though the trade of Guzerat has never again centred in the harbours of this district, Broach so far maintained its position that in the seventeenth century it sent ships eastward to Java and Sumatra, and westward to Aden and the ports of the Red Sea. The foreign trade of Guzerat centred more and more in Surat, until from Surat it was transferred to Bombay. The cotton exported from Broach to China and Bengal was sent through Surat and Bombay; and as far back as 1815 the Broach ports ceased to have any foreign commerce. They now possess only a coasting trade south to Bombay and the intermediate ports, and north as far as Mundvi in Cathay.

The city was twice (1536 and 1546) plundered by the Portuguese. In 1616 a British factory, and in 1617 a Dutch factory, were established here. In 1717 an attempt on the part of the English to take Broach failed, but in November, 1772, a second force was sent against the town, and this time it was stormed and captured. In 1783 it was handed over to Sindhiya, but was retaken by the British in 1803. The Parsees, from the number and antiquity of their Towers of Silence, are supposed to have settled at Broach as far back as the eleventh century.

BROAD STAIRS, a small but fashionable bathing-place in the county of Kent on the east coast of the Isle of Thanet, 77 miles from London, and 2 miles north-east of Ramsgate, has a station on the London, Chatham, and Dover Railway. There is a modern Gothic church, completed in 1865 by the addition of a spire; also Baptist and Wesleyan chapels. Broadstairs contains good hotels, bathing establishments, a picturesque little port, and the usual accommodations of a frequented watering-place. It was formerly called *Bradstane*, and is included in the parish of St. Peter (Thanet). There was a chapel here of such reputation that passing ships used to lower their topsails in its honour. The name is derived from the breadth of the sea-rite or "strand," which was defended by a gate and archway, of which a few portions may still be seen.

BROCADE, a fabric of silk to which a figured pattern of a damask character is given in the weaver. It is used in millinery, dress-making, and in upholstery for furniture, curtains, &c.

BROCCOLI, a plant of the cabbage tribe, producing its young flowers in very compact masses called heads—in consequence of their being closely enveloped by leaves, or partially blanched at the period when they are cut for the table. This plant is the *Brassica oleracea botrytis asparagifolia*, and differs from the other races of the same species not only in its flowers having this tendency to crowd together into fleshy heads, but also in the seeds being rather smaller. The varieties cultivated in this country have all sprang from two, the white and purple varieties, which Miller mentions in 1724 as coming from Italy. Broccoli seed is sown in open ground, like the kinds of cabbage, where the seedlings have leaves an inch or two broad; they are pricked out in new beds at the distance of 3 or 4 inches from each other. In a month or six weeks they become fit for taking to a final station, which should be in some rich quarter of the garden, in lines $2\frac{1}{2}$ feet asunder, the plants themselves being 2 feet apart in the lines. The season of the broccch is the autumn, winter, and spring, and the plants are made to produce their flower-sticks at these seasons by regulating the period at which they are sown. Broccch which is intended for autumn use is sown in March or the early part of April; if for winter use, in April or the beginning of May; and if for spring use, in the end of May. See CABBAGE.

BROCK'EN or **BLOCKS'BERG** (ancient *Bructerus*), the highest of the Harz Mountains, and though not central, yet the true nucleus of the group, as being composed of granite rising amid slate, to whose protusion the elevation of the whole group is due. It is 3740 feet high, and the highest mountain in North Germany north of the ranges that surround Bohemia. It is situated in the north-east part of the group, and may easily be reached from Hilsenburg or Harzburg. The summit forms a flattish ridge, declining on all sides by gentle slopes, so that the mountain has much the same form, that of a long swelling ridge, from all sides. Many popular superstitions are connected with it, some of which seem to have their origin in the appearance of a gigantic figure, called the Spectre of the Brocken, on the sides of the mountain at particular times. When the sun is low and unclouded, and a wall of fog on the mountain side, the image of an observer, between the sun and this wall, is projected upon it by unusual refraction of the rays, and greatly magnified; its movements follow those of the observer, but with gigantic strides. Objects on the mountain are also projected in the same manner. One of the many granite blocks of grotesque forms near the summit (whence the name Blocksberg) is pointed out as the altar at which the heathen Wends of old offered human sacrifices to Wotan or Odin, and is regarded as the meeting-place of the witches on the "Walden's Nacht," the eve of May Day. There is an inn on the top of the mountain kept open during winter, though the mountain is then usually covered with snow; a high tower near the inn affords in clear weather a most extensive view of the wide sea-like plain which surrounds this group, the towers of Hanover and Leipzig, and those of Cassel and Magdeburg, being all visible.

BROCKET is a term applied to a young male Deer in the spring of the year following its birth, when its horns are straight, unbranched, and stiletto-shaped.

The name is also applied to the deer comprising the genus *Smilax*, in which the horns are simple and never advance beyond the "brocket" stage. The Pita brocket (*Smilax rufus*) is a pretty little animal, about 29 inches in length, and of a reddish-brown colour. It lives in large herds in the low moist woods of South America. Though very fleet for the first burst, these deer are soon run down by dogs, and sometimes are captured by the Indians.

BRODIE, SIR BENJAMIN COLLINS, BART., a distinguished surgeon, was born at Winterslow, Wiltshire, on 9th Dec. 1783. Having devoted him self to the study of practical surgery, he was at a comparatively early period of life, and appointed surgeon to St. George's Hospital, obtained a very extensive and lucrative practice in London, and held the honour of being sergeant-surgeon to three British sovereigns. He was created a baronet in 1834, received from Oxford the degree of D.C.L. in 1850, and was a member of many learned societies. He died in 1862. He published several works, amongst them a treatise "On Dissections of the Joints," which looks as a standard authority.

BRODY, a town in Austrian Galicia, stands on the border of the Carpathian mountains, and has a population of 20,000, the greater portion of whom are Jews. The town is ill built, and dirty. The houses are mostly constructed of wood. There are three synagogues, one Catholic and three Greek churches, two important schools for Jews, a gymnasium, a hospital, theatre, and public baths. In a commercial point of view it is the most important town in Galicia, being the depot for the commerce of the kingdom with Poland, Russia, and Turkey. The trade, which is almost entirely in the hands of Jews, consists of cattle, horses, tallow, hides, leather, dried fruit, wax, honey, &c., which are the export trade of such colonial produce, and manufactured goods, which form the imports. The town has several large fairs. It is on the estate of Count Potocki, who has a large castle within its precincts.

BROEK or **BROCK**, a village in the province of North Holland, in the Netherlands, is the much-bepraised model of the precise neatness and punctilious cleanliness of the Dutch. In fact it is stated to be the cleanest place in the world. The narrow lanes that intersect it are paved with clinkers strewed with sand or shell, and always cleaned before a horse or vehicle of any kind is allowed to pass along them. The houses are of wood, painted white and green, and roofed with glazed tiles of different colours. The front doors and windows are never opened except on great occasions, such as a funeral, a wedding, or a christening. The interiors of the houses correspond to the exterior in order, cleanliness, and tidiness; but have more the appearance of large baby-houses than of the dwellings of men. The cow houses are curiosities in their way; they are washed out, walls and floors, several times a day; the cows' tails are fastened to hooks in the ceiling, lest they might by accident besmear their sides with them. Broek is 6 miles N. by E. from Amsterdam; it is famous for its sweet milk or "Edam" cheeses.

BROKEN KNEES (in horses), the name given to an injury to the carpus, caused by a fall or severe blow. It is not regarded in law as *unsoundness*, but it always constitutes a severe blemish, and detracts very considerably from a horse's value. Perhaps the most common cause of broken knees is the use of improper shoes, which prevents the natural free action of the fore legs, and makes a horse uncertain of his footing and liable to stumble. When the injury is slight, careful cleansing and the application of cold-water cloths and bandages are all that is needful to effect a cure. When the bones of the joint are opened into, fuller treatment is necessary. The animal must be kept on low diet, and freely purged. The injured parts should be covered with large linseed-meal poultices until the wounds suppurate, when, if the bones have not been injured, they will commence to heal rapidly. To assist the latter process mild stimulating or astringent washes are often useful, and when the wound is quite healed a mild cantharidine ointment may be used to induce the hair to grow over the scars.

BROKEN WIND is a peculiar affection of the *wind*, or breathing, of a horse, in which the expiration of the air from the lungs, occupying double the time that the inspiration of it does, requires also two efforts rapidly succeeding each other, and attended by a slight spasmodic action, in order fully to accomplish it. This disease may be recognized, moreover, by a characteristic low grunting cough, indicative of mischief in the lungs. On examination after death the organs will present more or less extensive traces of organic lesion; the air-cells, particularly round the edges of the lungs, will be found to be ruptured; the delicate partitions between them are broken down, and large irregular cavities are formed into which the air enters freely, but from which it cannot be expelled without an effort. Breathing becomes in consequence a work of labour, the animal is incapable of rapid or continued exertion, and if urged on will drop and die. This disease constitutes *unsoundness* of the worst kind.

The causes of this malady are various; often it results from inflammation of the lungs, during the continuance of which a portion of their cellular substance has been rendered impervious, greater labour being thereby thrown on the remaining parts, until the cells break down in consequence of their unnatural distension. Often also it is caused by severe exertion when the stomach has been previously filled or over-distended with coarse food, in which case the stomach presses against the diaphragm, and prevents the due and equable expansion of the lungs; at the same time the inspiration is hurried and violent, inasmuch that the portions free from this pressure become unnaturally dilated, and the cells give way. Farm horses fed upon coarse and innutritious food in the straw-yard, and put

to heavy work while the stomach is full, are very liable to become broken-winded. Occasionally there is a hereditary tendency to this disease, either from weakness of structure in the lungs or from narrowness of chest.

There is no cure for broken wind. Nevertheless, a broken-winded horse may, by judicious management, be rendered serviceable for easy work. Its diet should be nutritious, and in small compass; no straw or chaff should be allowed; the quantity of hay should be diminished, and that of the corn increased; a mash should constitute part of the evening fare, and water be given sparingly during the day. No work should be required when the stomach is full. Occasional or periodical fits of greater difficulty of breathing should be met by small bleedings and gentle laxatives.

BROKER, a person employed in the negotiation of mercantile transactions between other parties, and generally engaged in the interest of one of the principals, either the buyer or the seller, but sometimes acting as the agent of both. As it usually happens that brokers apply themselves to negotiations for the purchase and sale of some particular article or articles, they acquire an intimate knowledge of the qualities and market value of the goods in which they deal, and obtain an acquaintance with the sellers and buyers, as well as with the state of supply and demand, and are thus enabled to bring the dealers together, and to negotiate between them on equitable terms. There are separate brokers in London for nearly all the great articles of consumption.

It is the business of ship-brokers to procure goods on freight or a charter for ships outward bound, to go through the formalities of entering and clearing vessels at the custom house, to collect the freight on the goods which vessels bring into the port, and generally to take an active part in the management of all business matters between the owners of the vessels and the merchants, whether shippers or consignees of the goods which they carry. In the principal ports of this kingdom almost all ship-brokers are insurance-brokers also, in which capacity they procure the names of underwriters to policies of insurance, with whom they settle the rate of premium and the various conditions under which they engage to take the risk, and from whom they receive the amount of their respective subscriptions in the event of loss. Should this loss be partial, it becomes the duty of the broker to arrange the proportions to be recovered from the underwriters. Other brokers, when they give up the name of the party for whom they act, incur no responsibility as to the fulfilment of the contract; but an insurance-broker is personally liable to the underwriters for the amount of the premiums. But he does not incur any liability to make good the amount insured to the owner of the ship or goods, who must look to the underwriter for indemnification in case of loss. Merchants frequently act as insurance-brokers.

Exchange-brokers negotiate the purchase and sale of bills of exchange drawn upon foreign countries. Persons of this class are sometimes called bill-brokers; and there is another class called discount brokers, whose business it is to employ the spare money of bankers and capitalists in discounting bills of exchange.

Every person desirous of acting as a broker for the purchase and sale of goods within the city of London had formerly to be licensed by the lord mayor and court of aldermen. When admitted he had to find three sureties, two for his good behaviour as a broker, and one for his annual payment of the sum of £5 to the city. He was bound himself in the penalty of £1000, two of the sureties for £250 each, and one for £50. Any person acting as a broker without having procured the necessary license was liable to a fine of £100 for every bargain which he might negotiate, and the court of aldermen had power to discharge a broker for misconduct. These restrictions and

regulations were removed by the 33 & 34 Vict. c. 60, passed in 1870, except in so far as that the Act reserved the right of the court to require brokers to be admitted, and to receive from them a certain annual payment; but they are not required to give any bond on admission, and after they have once become brokers the court has no power to interfere with them in any way. One of the results of this alteration has been to bring about a large increase in the number of persons who act as stock-brokers in London without being members of the Stock Exchange. Most of these become sworn brokers, and give prominence to the fact in their efforts to obtain business by advertising, a practice strictly forbidden to the members of the Exchange. Any brokers guilty of fraud are to be disqualified from acting in that capacity.

The business of a stock-broker is that of buying and selling, for the account of others, stock in the public fund, and shares in the capitals of joint-stock companies. They are not a corporate body, but belong to a subscription house, and are admitted by a committee. The majority of them are sworn brokers. The brokers object to the regulation which requires them to make known the name of the principal for whom they act, and prohibits them from dealing themselves—both of which conditions are incompatible with the nature of their business. The Acts of Parliament by which the proceedings of stock-brokers should in certain cases be regulated have long been dead letters; more especially the enactment that every bargain or contract for the purchase and sale of stock which is not made *bona fide* for that purpose, but is entered into as a speculation upon the fluctuations of the market, is declared void, and all parties engaging in the same are liable to a penalty of £500 for each transaction.

Within the last few years there has been a large increase in the number of share-brokers in all the larger towns. They transact business, and effect transfers in canal and railway shares, and in the shares of joint-stock banks, gas, water, and other local works which are established by a numerous body of proprietors. There is a stamp-duty payable on transfers of stock, not public, of £1 10s. when a nominal consideration is given; if upon sale, 10s. per cent; debenture stocks, 2s. 6d. per cent; if upon mortgage, 6d. per cent. It is usual to apply the name of broker, but incorrectly, to persons who buy and sell second-hand household furniture on their own account.

Custom house brokers or agents were formerly licensed by the commissioners of customs, and no person without such license could transact business at the custom-house or in the port of London relative to the entrance or clearance of ships, &c.; but these licenses were all cancelled by a Treasury minute dated 18th March, 1861.

BROMBERG, the capital of a government in the province of Posen, in Prussia, called in Polish *Białogóra*, is situated on a hill above the Brda, about 5 miles W. from the Vistula, 67 miles N.W. from Posen, and has about 20,000 inhabitants. The canal which completes the navigation between the Oder and the Vistula enters the Brda at this place, and is here connected on the railway from Berlin to Warsaw, and from Berlin to Königsberg. The town is well built; it has a gymnasium, a training-school, manufactures of cloths, tobacco, linen and woollen cloth, Prussian blue, sugar, &c.; several distilleries and breweries; and a brisk trade in corn, cattle, &c. It is also one of the most thriving places in Eastern Prussia. The Brda is here crossed by a fine railway bridge, and there is a monument to Frederick the Great in the market-place. It is an old town, being mentioned as early as 1252, but suffered severely at several times from the effects of war and pestilence.

BROME-GRASS is a name applied to several species of the genera *Bromus* and *Seripolus*. These belong to the tribe Festuceæ, and therefore agree in the siliques

having two or more flowers, the upper often barren; the glumes falling short of the lowest flower; and styles short or none. They differ chiefly in *Bromus* having the lower glume one-veined, upper three to five veined, and *Serapideus* having the lower glume three to five veined, and upper seven to nine veined. None of the species are considered good agricultural grasses, though the Australian prairie grass (*Bromus Schraderi*) grows rapidly, and is productive. *Serapideus mollis* (lop-grass or soft brome grass) is met with on good pastures, but it is not a permanent grass. *Bromus maximus*, found in the Channel Isles, is a very beautiful grass.

BROMELIA CÆTÆ is an order of plants belonging to the Moxocoryllidæ. These plants are herbaceous, and are remarkable for the hardness and dryness of their gray foliage. They occur in great abundance in the tropical parts of the New World, or in such extra-tropical countries as, owing to local circumstances, have a climate of a tropical nature. The pine-apple, so well known as a valuable fruit, belongs to this order; and also Tillandsia, certain species of which have dry elastic leaves, which render them fit for stuffing mattresses and the like. Species of *Bromelia*, from which gums to order takes its name, afford fibre which is useful for weaving, and many are ornamental stove plants. *Bromelia Pimpin* is used in the West Indies as a vermifuge.

Exact mode of polygynous and regular flowers. The perianth consists of two series, the three outer segments are herbaceous and cylindrical, the three inner are coloured. There are six perfect stamens. The ovary is three-celled. The fruit is an induriscient berry, or a three-valved capsule. The seeds are numerous, with a minute embryo at the base of the fleshy albumen.

Tillandsia usneoides is well known in South America, where it is called Old Man's Beard. It is a mass of long black fibres, and grows on trees in the manner of lichens.

BROMIDE OF POTASSIUM (KBr) is a salt resembling the chloride, and crystallizing in anhydrous cubes; it may be formed directly by dissolving bromine in a solution of caustic potash, or by acting on a carbonate of potassium by hydrobromic acid, or by decomposing bromide of iron by carbonate of potassium. It is used in photography, especially in the gelatine dry-plate process. Its most important use is, however, in medicine, as a cathartic, in small doses, and in larger doses as the best known remedy in epilepsy. It can be taken in large doses without inconvenience, and has no disagreeable after-effects. Its use can also be continued for a long time, but it would be pure and free from all traces of soluble potassium, as iodine accumulates in the system, and gives rise to the distressing symptoms known as iodism.

BROMINE, an elementary fluid body of great density, discovered in 1826 by M. Balard, and named from *βρῶμος* (stinks), on account of its strong and disagreeable odour. It is found in sea-water, in salt springs, in mineral waters, in many marine plants, and in some marine animals. Balard first procured it from a salt spring, but it is now obtained from various sources, principally from kelp, or the ash of seaweed, from the mother liquors of the Staffordshire and Cornwall, and from a somewhat similar deposit in Antrim. The latter is now the largest source.

Bromine is a fluid of a deep brown red colour; it is a strong antiseptic, and very poisonous. Its specific gravity is 2.966. It is extremely strong, greatly resembling that of chlorine. When exposed to a temperature of 22° C., or 79° F., it becomes solid, it becomes a solid, crystalline, brittle, and green mass, with slightly metallic lustre. It boils at 58° C. (136° Fahr.) is very volatile, and belongs to the same class as chlorine and iodine. It is very corrosive. It is an accumulator of electricity, and its symbol is Br, atomic weight, 80. It is a powerful bleaching agent, and has great affinity for hydrogen. It dissolves sparingly in water, more soluble in alcohol, and very soluble in ether. It forms a crystalline hydrate with water,

having the composition $\text{Br}_2\text{H}_2\text{O}$. It is usually extracted from the mother liquors containing it by distilling with peroxide of manganese and strong sulphuric acid, the bromine being collected in suitable leaden condensers under water.

Bromal ($\text{C}_2\text{HBr}_3\text{O}$) is a compound obtained by the action of bromine on alcohol, and resembling chloral. It is a colourless oil, of specific gravity 3.34, and with water forms a crystalline bromal hydrate ($\text{C}_2\text{HBr}_3\text{O} \cdot 2\text{H}_2\text{O}$).

Bromoform (CHBr_3) is obtained by decomposing bromal by alkalis. It is a dense liquid, of specific gravity 2.13, of agreeable odour, and resembling chloroform, but it is less volatile. Bromoiodoform (CHBr_2I) is also known as a colourless volatile liquid.

Oxygen and *bromine* combine to form hypobromous acid (HBrO) and bromic acid (HBrO_3). The latter is an acid syrupy liquid, which forms a well-defined series of salts called bromates, none of which are important. *Hydrogen* and *bromine* combine to form hydrobromic acid (HBr), a colourless gas, with an odour resembling that of hydrochloric acid, a specific gravity of 2.731, a corrosive action on metals, and of ready solubility in water. Hydrobromic acid forms with the metals, alkalis, and alkaline earths a series of salts called bromides, many of which, as those of silver, zinc, iron, sodium, magnesium, and potassium, are used in photography, and some in medicine. Some of the insoluble metallic salts are coloured; the soluble crystalline salts are mostly colourless, and resemble the chlorides. *Chlorine* and *bromine* form chloride of bromine. It is a reddish-yellow liquid, with a strong disagreeable taste and odour. *Carbon* and *bromine* unite in various proportions, forming several bromides of carbon. *Sulphur* and *bromine* combine to form a fuming reddish oily fluid called sulphide of bromine. *Phosphorus* and *bromine* combine readily to form two compounds—the protobromide, which is liquid, and the perbromide, which is a yellow solid. *Bromine* and *iodine* also combine.

BROMLEY, a market-town in the county of Kent, is situated above the east bank of the Ravensbourne, 11 miles from London by the South-eastern Railway. It is a flourishing town, and has two railway stations, some good farms, a large number of villas and first class mansions, and a charitable establishment called Bromley College, founded in 1666, and enlarged and endowed by many subsequent benefactors to support forty clergymen's widows. The church has a low tower at the west end, massive and embattled. The entrance to Bromley churchyard affords a specimen of the ancient *lich gate*, where the corpse rested before it was borne into the burying-ground. Dr. Hawkesworth, author of the "Adventurer," lies buried here. The population in 1881 was 15,153, an increase of 1479 since 1871. There are Congregational, Baptist, and Wesleyan chapels, and a new cruciform church, erected in 1867. A new town-hall was built in 1861, embracing a large hall, reading-room, and library, with accommodation underneath for the weekly market. Bromley is a polling place for the county, and the head of a poor-law union. From the eighth century the manor has vested, with little interruption, in the bishops of Rochester. The present palace was rebuilt on an ancient site in 1777; it is a plain brick building, on an eminence near the town. An ancient spring in its gardens has medicinal properties similar to those of Tunbridge; it is known as St. Blaize's Well. After being neglected two or three centuries, it was reopened in 1756. Here Bishop Atterbury resided when he was visited by Pope and Swift, and formed the plots which subsequently led to his exile. His daughter-in-law was afterwards a pensioner at the college.

BROMOFORM. See BROMINE.

BROMS EBRO, a village of Sweden, in the province of Calmar, 29 miles S.W. of the town of that name. It is famous for the treaties entered into between Sweden and Denmark in 1511, 1611, and 1645.

BROMS' GROVE, a market-town in Worcestershire, 12 miles from Birmingham and 127 from London by the Midland line, is situated in a fertile and wooded vale on the small river Salwarp. The town is well paved, and abundantly supplied with water. It contains a parish church, with very fine tower and spire, 189 feet high; several Dissenting chapels, including a Gothic Baptist, erected in 1867, and a Roman Catholic, in 1863; a grammar-school, the chapel of which was enlarged in 1867, with endowment of £528 for exhibitions to Worcester College, Oxford; a town-hall, and a market house; and has manufactures of linens, woollens, &c. Nail and button making are the principal trades. The population of the town is 7959. In Bromsgrove Lickey, a range of hills on the N., the Salwarp and several affluents of the Trent and the Severn take their rise. Near it is a mineral spring and the Birmingham Sanatorium.

BROM' WICH, WEST, a market-town in the county of Stafford, is on the highroad from Birmingham to Liverpool, about 6 miles N.W. from the former, and 133 from London by the Great Western Railway. The town, formerly an inconsiderable village in the midst of a wild heath, is now one of the busiest centres of the "Black Country." Iron and coal underlie the whole of it; and the development of these mineral resources has led to a change on the surface-ground scarcely paralleled in England. For 3 miles along the highroad a continuous town now exists, filled with workers in iron, while on either side iron-mines, coal-mines, and smelting works have been established in great numbers. The articles made consist of almost every description of iron goods, but more especially of the heavier kinds, such as boilers, anvils, anchors, and gauges. The gas-works belonging to the Staffordshire and Birmingham Gas Company are amongst the largest in existence. The place is altogether very irregularly laid out, and its proximity to the coal-pits and iron works gives it a very unprepossessing appearance. In 1875 the town commissioners completed the erection of several important public buildings, including a town-hall and commissioners' offices, free library, and covered and open markets. There are about nine churches, thirty Nonconformist places of worship, and numerous board and other schools. Dartmouth Park, the gift of Lord Dartmouth, opened in 1878, consists of 56 acres of fine undulating land, and commands one of the best views in South Staffordshire. The population in 1881 was 56,299, an increase of 8381 over 1871.

BRONCHI and **BRONCHIAL TUBES**. The *trachea* or *windpipe* receives the air needed for the respiration of nearly all the vertebrate animals (except fishes), and conveys it to the lungs, where it aerates the blood. Whether it is short, as in mammals, or long, as in birds, it eventually divides into pipes (usually two) of similar construction to its own, which are called *bronchi*, each lung being supplied by one *bronchus*. In the lungs of mammalia the bronchi subdivide, and their ramifications are called the *bronchial tubes*. The bronchi are, like the windpipe, composed of rings of cartilage, nearly complete but not quite, except in birds, the ends of the rings in the other mammals being joined by fibrous membrane and muscle. Although these tubes are therefore slightly capable of dilatation or contraction, they are thus quite incapable of collapse, and always afford free passage to the air. The larger bronchial tubes are also somewhat cartilaginous, but of fixed capacity, and as the branches ramify they become more muscular or membranous and less cartilaginous, till they ultimately end in the air-cells of the lung. Thus it is evident that the finer bronchial tubes may be closed if from any cause their walls are stimulated to contraction, and it is considered that they do so contract in the act of expiration, and in this way assist in driving out the breath. In man the dilatations of the ultimate bronchial tubes, the air-cells themselves, where aeration goes on, are

about one fortieth of an inch in diameter; they have very elastic closely folded or pouched walls, which carry the extremely fine ramifications of the pulmonary artery and the pulmonary vein; the first bringing the dark used-up blood to be refreshed, and the second carrying away the bright-red oxygenated fluid to the heart.

All vertebrates with lungs have bronchi, and this means practically all vertebrates but fishes (which breathe by gills, not lungs), but all have not bronchial tubes. In many amphibians and snakes, where the lung sac is very long, the bronchi open direct into the lung, which at their junction is somewhat finely divided into cells or pouches (sacculated), but at the further end becomes alone smooth. It is perhaps necessary to remark that snakes have usually two lungs, although one is so extremely small compared to the other as to be rudimentary; in a few poisonous snakes one is absent altogether, when the windpipe becomes sacculated at its posterior extremity. The lizards resemble the snakes, but the turtles and crocodiles have bronchi traversing the lung from end to end. They have not any bronchial tubes, however, but as the bronchus progresses apertures on each side of it open into the cellular sacs of the lung. In fact a crocodile's lung is a series of snake-lungs strung along a bronchus. Birds have a very highly-developed bronchial arrangement. The bronchi at once lose their cartilaginous structure on entering the lungs of birds, and dilate, peering forwards and gradually narrowing again till they reach the further extremity of the lung, where they open into the posterior air-sacs. In the passage they send off canals, which are rather smaller than bronchial tubes, since they do not end in air-cells but in air sacs. There are altogether nine of these air sacs, two posterior or abdominal, four thoracic, two cervical, and one interclavicular, formed by the union of an artery with each lung. There are, in addition to these canals, the branches of the bronchial tree which ramify in the bronchial tubes, ramifying as they do to the minute structure of the lungs. The air sacs appear to communicate with the great bones, whose hollows are thus filled with air, and it is this that gives the bodies of birds such extended airy lightness. Further, by the large distribution of air throughout the body, in the direct circulation goes on with a general current of blood (the *systema circulatio*) as well as that sent specially to the lungs (the *pulmonal circulation*). Birds, therefore, have a higher temperature than the other vertebrates, since their blood is more efficiently and rapidly aerated. From the same cause they can the less trouble support exposure to an impure atmosphere, and feed on which would yet nourish a reptile perfectly well to feed to a bird. The singular organ or *series* of birds is either at the junction of the bronchi with the windpipe or at the commencement of each bronchus.

In mammals there is in many animals a third bronchus, generally additionally supplying the right lung. Thus in porpoises and in pigs the windpipe gives off a third bronchus, while in bears and in seals a similar result is obtained by the forking of the right bronchus after it leaves the windpipe. In all mammals the bronchi divide into bronchial tubes, which continue to ramify till they end in a cluster of air cells.

BRONCHITIS, inflammation of the Bronchum. The air tube, or windpipe, is divided into several portions. Each of these portions possesses a peculiar structure, and performs a specific function. Of these divisions the first is termed the larynx, which constitutes the principal organ of the voice, and is situated at the upper part of the neck. Immediately continuous with the larynx is a large tube called the trachea, situated at the fore part of the neck. Opposite the third vertebra of the back the trachea divides into the bronchi.

The larynx, the trachea, the bronchi and their ramifications, together with all the cavities of the nose, the mouth,

and the pharynx, are all classed together under the common name of the air-passages. All these parts are lined by a membrane, which, from the nature of its secretion, is termed mucous membrane. The diseases of this membrane and the tubes are congestion, inflammation, hæmorrhage (effusion of blood from its surface), emphysema (the dilatation of the tubes), and polypi (concretions growing from its surface, which obstruct, and sometimes nearly obliterate, the tubes).

Of these diseases inflammation, either in an acute or chronic form, is by far the most common and the most important. The first of these forms, viz. acute bronchitis, may occur at any age, but it is most common in young children and in old people. It is generally caused (perhaps in nine cases out of every ten) by exposure to cold. Any sudden chill, such as that caused by passing out of a warm room into a cold atmosphere without suitable precautions, sitting in a draught, or through wearing insufficient clothing, thin shoes, &c., may result in an attack of bronchitis. It may also result from exposure to an atmosphere loaded with irritating particles, such as cotton fibre, steel dust, or charcoal, and it occurs frequently as a complication of an organic disease, or as a consequence of chronic alcoholism. Its symptoms are usually similar at the onset to those occasioned by an ordinary cold—irritation in the nose, causing frequent fits of sneezing, watering of the eyes, fits of shivering, headache, irritation in the throat, a feeling of oppression in the chest, or one of heat and rawness with a pain under the breast bone. In a little while cough sets in, usually coming on in paroxysms, at first attended with but little expectoration, but afterwards with a good deal, the mucus being thick and adhesive. An examination with the stethoscope, or by placing the ear against the chest, reveals the fact that the natural sounds of respiration are increased in some parts and suppressed in others. As one of the earliest effects of inflammation, the bronchial mucous membrane becomes somewhat thickened, and the air in passing over it gives rise to a dry sonorous sound, and as the secretion of this membrane is increased the breath is heard bubbling through the mucus. There is generally also a hot and feverish feeling present, but the temperature is usually but slightly elevated, and sometimes there is great mental and physical depression. Except in the case of young children, who are often too weak to struggle against the disease, or where other complications are present, bronchitis is seldom fatal in its first attack. It is, however, a serious affection, and should on no account be neglected, as inattention to proper treatment and careless exposure to cold may lead to a fatal result, or may bring about serious complications of a persistent and chronic character. With regard to the treatment, when the disease is present in a mild form, confinement to the house, in a uniform temperature in a warm room, is of the first necessity. The room should not be made too hot, about 60° to 65° Fahr. being most favourable to the progress of the cure. A free action of the skin should be promoted; a hot bath or the putting of the feet into hot mustard and water before getting into bed, extra bed clothing, and a warm draught before lying down, being excellent ways of getting into a profuse perspiration. Where there is a feeling of pain and oppression in the chest, a mustard plaster or a couple of hot lead blisters, followed by two or three poultices of linseed meal, will often afford very great relief. The inhalation of the steam from hot water is also often of considerable service. An apparatus termed an inhaler has been designed for this purpose, and when available is very effective. A more simple way is to pour the boiling water into a jug, and after placing a towel round the edge, to rest the face on it and inhale the rising steam. A kettle of water placed over the fire, with the spout projecting into the room, will serve to keep the air moist; and the addition of a little chloric ether to the water, either when used in

this way or for inhalation, may be tried when the cough is very irritable. The food should be of a nourishing and easily digestible character, such as strong beef tea, milk, &c., and if there is much prostration stimulants may become necessary. The medicines used are at the outset such as tend to allay fever and promote perspiration. When the feverish symptoms have subsided, when all uneasiness of the chest is gone and the cough is but slight, some light tonic medicine will assist in restoring strength and in preventing a relapse. The most dangerous form of acute bronchitis is that in which the smaller air-tubes are affected. This is termed "capillary" bronchitis, and is more common in children than adults, though some of the worst cases are met with in connection with emphysema of the lungs. The approach of this disease is marked by symptoms of greater severity than the ordinary form. Well-marked rigours, headache, sickness, an almost continuous cough, and distressing shortness of breath soon become apparent. The temperature is considerably raised, reaching 100° Fahr. or more, with a quick full pulse. These severe symptoms may subside and the patient gradually recover, but when the disease progresses unfavourably the lips and face, and even the ears, hands, and feet, become blue and cold from the imperfect aeration of the blood. The temperature falls, the pulse becoming small and rapid; cold, clammy perspirations break out about the face and chest; there is great weakness and delirium, and the breath gradually fails, the lungs becoming closed up by the accumulated mucus. The treatment consists in efforts to maintain the strength of the patient and to promote expectoration. Stimulants must be given from the first for the former purpose, and the administration of an emetic may assist the latter.

Chronic Bronchitis is usually the result of the auto-affection, most generally from several repeated attacks. Persons who are much exposed to the weather, and those advanced in life, are most usually the subjects of this disease. It is sometimes attended by many of the symptoms we have mentioned in connection with the acute form, but more generally there is but little interference with the general health for a long time. In bright, fine weather the patient suffers but little from his complaint, but the advent of the winter months is attended with the appearance of a troublesome cough. He is also, as a rule, very ready to take cold, and is highly susceptible to changes in the weather. The cough, which is generally at its worst early in the morning, is accompanied by free expectoration, the latter sometimes becoming very copious indeed. The breath is very short and difficult; and though the life may be prolonged many years, the disease gradually increases in intensity, until either of itself or in connection with some induced complaint it causes death. The treatment must be modified according to age, constitution, circumstances, &c., attention to the general health being absolutely necessary. The exhibition of tonics—iron, oxide of zinc—and the use of cod-liver oil and pancreatic emulsion are all of value. Such medicines as carbonate of ammonia, senega, squill, &c., are very serviceable, and tar taken in the form of pills or of tar water is a favourite remedy on the Continent. One of the best remedies for chronic bronchitis is found in the inhalation of a spray of ipecacuanha diluted with twice the quantity of water. Great care should be taken to avoid exposure to wet and cold, and a respirator worn in cold damp weather is often a valuable protection.

Bronchitis, in animals, or inflammation of the *bronchi* or air-tubes of the lungs, is a very serious disease among quadrupeds. It is generally confined to the mucous membrane lining those passages, but more frequently it spreads to the lining membrane of the windpipe and larynx, and also involves to a greater or less degree the substance of the lungs.

Horses.—Bronchitis is not a very common disease in the

horse; nevertheless it does occur, sometimes as a primary disease, but oftener as the result of neglected catarrh. It is characterized by an interrupted wheezing sound in the breathing, that can be heard at some distance. The limbs are cold, the pulse quick, the nostrils dilated, the respiration strangely quickened, the countenance haggard and distressed, and the fear of suffocation renders the animal unwilling to move; the cough increases, and is evidently painful; a purulent discharge, at first of a grayish-green colour, but which soon becomes fetid and mingled with blood, oozes from the nostrils; the breath is hot, and pieces of hardened mucus or organized membrane are frequently coughed up. As the disease pursues its course the mucous lining of the bronchial tubes becomes more and more thickened, and consequently the calibre of those tubes is diminished; they are clogged with mucus, and the animal dies suffocated.

Treatment.—Bleeding, but with caution, should be early resorted to; but the moment the pulse falters the vein must be closed, and this will occur even before 4 lbs. of blood are abstracted. Mild aperients must also be administered, but care must be taken lest an uncontrollable diarrhoea be induced. Two drachms of aloes may be given morning and night until the bowels act sufficiently; then powdered digitalis, nitre, and sulphur should be administered morning and night, in doses varying according to the circumstances of the case. From half a drachm to 2 drachms of the first may be given, and from 2 to 4 drachms of the nitre and sulphur. A blister should be applied to the brisket and sides, extending up the windpipe even to the throat; and, for diet, nothing more nutritive than mashes should be allowed.

Cattle.—Bronchitis is a formidable and common disease among cattle, and especially young cattle, in low marshy woody districts. It prevails during dry seasons, when the ponds are half dried up, and contain putrescent mud, exhaling noxious miasmata, and when animalcules abound in every stagnant water. A neglected winter cough, mouldy hay and bad straw, the refuse of the farm, are among the causes of this disease, and many a beast comes from the straw-yard bearing the seeds of death within him.

Bronchitis generally comes on suddenly. The animal begins to cough, the cough increases in violence and frequency, and is dry, husky, and very distressing; there is soon but little intermission; the wretched beast stands with its head stretched forwards, its nostrils dilated, its coat staring, its flesh wasted, and its countenance expressive of great anxiety. This state of misery may continue for two, three, or four weeks, till the animal dies exhausted, or becomes suddenly suffocated. On examination after death the bronchial tubes exhibit, more or less, the signs of inflammation; and not only these passages, but the windpipe, and often the larynx and the fauces, are filled with small worms mixed with the mucus, in vast numbers, so as to choke up the tubes, and ultimately produce suffocation.

These parasitic worms are thread-like, and from 1 to 2 inches in length; the body is round, the head obtuse, the mouth circular, and surrounded by minute bumps or elongated papillae. The tail of the female is pointed, that of the male rounded and oblique. The female usually contains a great number of eggs. It cannot be doubted that these worms multiply in the bronchial tubes; and it would appear that their eggs are received either with the bad food or bad water, escape the digestive action of the stomach, thread the various circulatory passages until they arrive at a congenial abode, and there become developed, and breed; or it may be that the eggs are hatched by the warmth and moisture of the mouth, and then it is that the young worms wind their way to their destined residence.

Treatment.—The great object at the commencement of the attack is to subdue the inflammation by bleeding, aperients, and sedatives, and next to destroy or remove

these parasites. But how is this to be done? The most obvious method is to cause the animal to breathe some pungent and deleterious gas, as that produced by the burning of sulphur or the evolution of chlorine. By both these fumigations the worms have been quickly and perfectly destroyed. But there is considerable care required in the management of these experiments; inflammation of the air-passages may be excited to such a degree as rapidly to destroy life, and therefore the inhalation of these gases is fraught with danger. Doses of spirit of turpentine have been recommended. The turpentine, so destructive to worms, is taken up into the system, enters into the circulation, and is recognizable both in the urine and breath. It is thus brought into contact with the worms, which it destroys. Their hold being loosened they are easily expelled by the act of coughing. The dose of turpentine for adult beasts may extend from 2 to 4 ounces, with a little linseed-oil, a few drops of oil of caraway, and a small quantity of gruel. Common salt is a powerful vermifuge, and so is lime-water; and a draught, composed of half a pint of lime-water with 2 oz. of common salt, is recommended as a dose to be given every morning till the animal improves. Change of pasture is essential. This disease occasionally appears in lambs, deer, and swine.

BRONCHOCLE (Gr. *bronchocle*, from *bronchos*, throat; and *cle*, a swelling), called also *Goitre* and *Derbyshire Neck*, a swelling in the upper and fore part of the neck, occasioned by a preternatural enlargement of the thyroid gland. The tumour is free from pain, generally of the natural colour of the skin, does not readily inflame, and is not of a malignant character. Often the swelling is rather a deformity than an inconvenience; but occasionally, and especially when the tumour is large, it causes serious evil, by obstructing the voice and the respiration.

But little is known of the real nature of this disease. All that is certain is that there are countries, or rather particular places in certain countries, for example, Switzerland, Savoy, the Tyrol, certain districts of South America, the Indian Punjab, where 60 per cent. of the population are affected, and some places in Great Britain, as Derbyshire, in which the disease is *endemic*, and that it is caused by the drinking water used in these districts, which contains impurities of a metallic character. It is much more common in females than in males. In Great Britain it is very seldom seen in males; but in Switzerland, in Alpine Italy, as at Aosta, and in other places in which it is very prevalent, males are more often attacked than in Britain. Goitre is the great distinguishing mark of cretinism. [See CRETINISM.] Healthy persons may have goitre and be cured, but speaking generally, as Maffei ("Cretinisme," Erlangen, 1844) has said, "Goitre is the beginning of that degeneration of which cretinism is the end." Still it must, like dropsy, be regarded as a symptom rather than as a disease; and it is known, for instance, to arise amongst weavers from the emanations from the flax, and also to be a symptom of certain obscure uterine affections.

But in whatever obscurity the nature and cause of this disease may be involved, there is a very effectual remedy in iodine. This is applied to the surface by painting, or by the use of the iodine ointment, and, where the enlargement is fibroid, by means of an injection into the gland. Setons passed through the gland are often very useful, and in India biniodide of mercury has been employed with great success. The method of using the latter consists of smearing it over the swelling, and then causing the patient to sit for a long time exposed to the heat of the sun.

BRONI, a town in the province of Alessandria, Northern Italy, about 11 miles S.E. of Pavia, at the foot of the Apennines. Some portions of the old church date from the tenth century. The Castle of Broni is near to the town. It was here that Prince Eugène defeated the French in 1703. Population, 5000.

BRONTE, a town in the province of Catania in Sicily, is situated at the western base of Mount Etna, and about 22 miles N.W. of the city of Catania. It has a population of 16,577, who manufacture coarse woollens and paper, and raise large quantities of corn, wine, fruits, and silk. Lord Nelson was made Duke of Brontë by the King of Naples in 1799, with an income of 6000 onzè, or about £3700 sterling.

BRONTE, CHARLOTTE, one of the foremost novelists of the century, was the daughter of the Rev. Patrick Brontë, a native of the County Down, in Ireland, and minister of Thornton, near Bradford, Yorkshire. Charlotte was born there in April, 1816, and very soon after her birth her father was promoted to Haworth, and the family removed there. When the mother and the children grew up as best they might in a place so wild and bleak, and amongst people and society so savage that the minister habitually carried a pistol when he went abroad. The strange life Charlotte and her sisters led is reflected so faithfully in "Shirley" that her incident was at once destroyed by a notice in the *Times* published reading the

book. If the country was strange so also was the Brontë family. The incident in "Shirley" where the heroine burns her flesh with a hot iron, where a mad dog has bitten her, happened to Emily Brontë; the incidents of school life in "Jane Eyre" were taken from Charlotte's life. They were small, delicate children, and were left much alone by their strange father; the girls were inveterate scribblers, the boy as much of a debauchee as the wild place permitted. Every sort of literary composition was produced by the children, unknown to anyone but themselves--Charlotte's share being twenty-two volumes of MSS. They all had a laudable ambition to earn their own living, and finally Charlotte and Emily obtained funds from a relative wherewith to go to Brussels to study French and qualify themselves for teaching. On returning home the sisters published, on quite impossible terms, a volume of "Poems by Currer, Ellis, and Acton Bell" (the names assumed by Charlotte, Emily, and Anne Brontë). It appeared in 1846, but was not of sufficient merit to command attention. A tale of Charlotte's, embodying her Brussels experiences ("The Professor"), was offered in vain to publisher after publisher,



Brontë.

to Smith, Elder, & Co., first ruling it as profitable, asked for a novel in three volumes by the author in its stead, and "Jane Eyre," on which she had for some time been engaged, was therefore eagerly purchased and sent up to them. It was warmly accepted, and on its publication (in 1847) excited a burst of admiration. Its intense, vivid, and glowing scenery, its quite unconventional freshness, the energy and vigour of the party which it revealed in the author who seemed to penetrate her life in such compromising situations, the complete familiarity with wild moorland scenery, and with the soul and stern of such spots, together with the blissful innocence displayed as to the etiquette of society, all stimulated curiosity as to the personality of "Currer Bell" to the utmost. Ifriet Martineau has left an amusing account of the way in which, even in correspondence, the sex and station of the writer was concealed from her till her actual entry into the room ("Autobiography," vol. i.) In 1849 "Shirley," as above said, betrayed her. It was an advance in style upon "Jane Eyre,"

and was itself surpassed by a third novel, "Villette," in which Miss Brontë reworked the Brussels materials of "The Professor," but this time with the most finished art. In 1854 she married her father's curate, Mr. Nicholls, but her delicate health rapidly became more dangerous, and she died in March, 1855. Her close friend, Mrs. Gaskell, wrote an excellent memoir of her, full of interesting detail of her sad, strange life. Her brother had sunk from vice to vice till life thickened out in 1818; Emily died the same year, and Anne the year after. From 1849 Charlotte was alone with her eccentric father; he constantly threatened with blindness, she always ailing. Emily's novel of "Wuthering Heights," and Anne's of "Agnes Grey," have power, especially the first. They are of the same cast of thought as Charlotte Brontë's, but bear no comparison with hers in literary excellence.

BRONZE (Ital. *bronzo*; Fr. *bronze*; Gr. *chalkos*; Lat. *aes*) is essentially a compound of copper and tin, which metals appear to have been among the earliest

known. Copper is not unfrequently found in its metallic state, and fit for immediate use; and tin, though not so met with, often occurs near the surface, and its ore is easily reduced. These metals, though neither of them possesses the hardness requisite for making instruments either for domestic or warlike purposes, appear to have been early found capable of hardening each other by combination; the bronze, which is the result of this combination, consisting of different proportions of them, according to the purposes to which it is to be applied.

Bronze is always harder and more fusible than copper; it is highly malleable when it contains 85 to 90 per cent. of copper; tempering increases its malleability; it oxidizes very slowly even in moist air, and hence its application to so many purposes. The density of bronze is always greater than that of the mean of the metals which compose it; for example, an alloy of 100 parts of copper and 12 parts of tin is of specific gravity 8.80, whereas by calculation it would be only 8.63.

The green hue that distinguishes ancient bronzes is acquired by oxidation and the combination with carbonic acid. The Greeks and Romans, in speaking of works in bronze, used words which at once referred to the metal, the Greek *chalkos* being a mixture of copper and tin, and the Roman *aes* the same. These words are often understood by moderns to denote brass, which is, however, a different composition, being a mixture of copper and zinc.

It has already been stated that bronze for different uses varies in composition. Bronze for cannon in England is composed of 90 copper and 10 tin. The addition of phosphorus has been found to increase the malleability, and give great toughness, hardness, and malleability. Phosphor bronze is now used in ordnance guns, and is found to wear well and stand heavy charges of powder. It is less acted on by sea water, and has been used in screw propellers. Bronze for cymbals and tambours is composed of copper, tin, and antimony; in France, of 100 copper and 11 tin. Dr. Thompson found English bell-metal to consist of -- copper, 80; tin, 10.1; zinc, 5.6; lead, 4.3 = 100. The lead and zinc render the metal more fusible. The artistic and other bronze productions of Paris command the markets of the world, both on account of their intrinsic excellence and reasonable price. Their total value is nearly £3,000,000 annually, the work of about 11,000 persons.

A variety of bronze is known as speculum metal, and used for the reflecting mirrors of astronomical telescopes.

Aluminium bronze, called by a variety of names, as oride, Abyssinian gold, &c., is largely used in making watch chains and other articles of jewelry in imitation of gold, which it very closely resembles. It contains 7 per cent. of aluminium combined with copper. It is a valuable metal, of great strength, and if it could be procured cheaply would have many important applications. At present the cost of aluminium limits its use to small articles.

BRONZE AGE, the name given by archaeologists to that period in the history of a people of race during which bronze was the chief material used for tools and weapons. The term was first brought into general use by the antiquaries of Denmark and Sweden, who in the earlier half of the present century proposed to divide the human period into the ages of stone, bronze, and iron. According to this theory it is presumed that the first tools and weapons used were made of wood, bone, horn, and of stone, the use of metals being unknown. Copper and tin, having been discovered, and an alloy of them being found suitable for both weapons and tools, the use of bronze gradually superseded that of stone, and prevailed until the discovery of iron, which marked a fresh era in the history of mankind.

Bronze articles have been found in abundance in the Swiss lake villages—swords, axes, spear-heads, arrow heads, sickles, knives, adzes, and various personal ornaments of beautiful workmanship, all of which, as well as the

pottery, show an advance on the art of the stone age. The researches of Dr. Keller in these lake villages show that the implements found in some of them are all stone, in others they consist altogether of bronze, and again in others stone and bronze articles are mixed. Sir J. Lubbock, in "Prehistoric Times," agrees with Dr. Keller in thinking that bronze came into use gradually among the stone-using people. Professor Boyd Dawkins states that in some of the lake dwellings bronze swords have been found with the hilts inlaid with iron, and also iron swords of the same leaf-shaped type as those of bronze. This evidence of the gradual passage into one another of the three ages, is confirmed by the inspection of many tumuli, where the first interment belongs to the Neolithic, and the second to the Bronze age; for it is highly improbable that a new and exterminating race would use the tombs of their enemies. When Cortes conquered Mexico, he found the natives in the transition age between stone and bronze, some of their implements being of stone, some of obsidian, of copper, or bronze. Even at the present day there are several savage tribes still in the Stone age; the Bushmen, Hottentots, and Kafirs use stone and bone as well as iron for their implements.

Judging from the bronze objects found in the burial mounds round Stonehenge, Sir J. Lubbock thinks that this "great temple" may "be regarded as a monument of the Bronze age, though apparently it was not all erected at the same time, the inner circle of small unworked blue stones being probably older than the rest."

Homer and other early writers testify to the wide-spread use of bronze weapons on the shores of the Mediterranean, and the gradual introduction of iron, and thus the Bronze age of Southern Europe is connected with history; but it is by no means easy to determine the origin of bronze in central and north Europe. That it was not introduced by the Romans is clear for many reasons; the bronze of north Europe consists of nine parts of copper and one of tin, whereas the Roman bronze had a large admixture of lead; the Roman swords were of iron, and of a different shape from the northern bronze swords; and these, moreover, are very abundant in Denmark and Iceland, where the Romans never penetrated. Professor Nilsson is of the opinion that the Phœnicians introduced bronze into north Europe, and certainly the unity of type of the implements, and the almost complete absence of weapons of copper, point to its foreign origin and introduction by a single nation. But the ornamentation in right lines, so common on the bronzes of the north, is not Phœnician, but probably Etruscan. The form of the implements also agrees with the Etruscan. See ARCHAEOLOGY.

BRONZE-WING (*Phaps chalcoptera*) is a Pigeon widely distributed in Australia. It is of a greenish-brown colour, with a large spot of brilliant coppery blue on each feather of the wing-coverts; the forehead is buff or buffy white, and there is a large white streak under each eye. The bronze-wing possesses excellent powers of flight, an endowment which is necessary to it on the drier parts of Australia, to enable it to visit the scattered supplies of water. It nevertheless feeds entirely on the ground, and often frequents the stubble fields in great abundance, when it may be easily shot. The flesh is excellent, the bird weighing when in good condition fully a pound.

The bronze-wing belongs to the order COLUMBÆ.

BRONZING is the name given to the process whereby articles of metal, ivory, wood, porcelain, clay, plaster, &c., are made to appear like bronze. Various methods and materials are used for this purpose, according to the nature of the object to be covered or the quality of the work desired. Coins, medals, and other small articles of copper, are made to assume a fine reddish-brown colour by boiling them in vinegar, in which two parts of verdigris to one of sal ammoniac have been dissolved. Gun-barrels are browned

by means of the chloride or butter of antimony, which is rubbed over them after they have been first slightly heated, the barrels being afterwards cleaned, oiled, and burnished. Articles made of cast iron are bronzed by being rubbed with vegetable oil, and afterwards exposed to carefully-regulated heat in a drying oven. For objects of tin or white metal, a solution of two parts of sal-ammoniac to one of alum and one of arsenic, dissolved in strong vinegar, is employed. For articles of wood, clay, plaster, &c., the processes are of a different description, *bronze powders* being chiefly used for work of this kind. The finest bronze powder is made by rubbing down leaf gold, with honey, on a stone, the honey being afterwards washed out and the powder dried. An inferior description, known as German gold powder, is made from the poorer qualities of gold leaf, in the making of which the metal has been alloyed with silver and copper. The *mosaic gold* used for bronzing-powders is made by grinding down an amalgam of one part of mercury to two of tin, with sal-ammoniac and sulphur, the whole being afterwards subjected to the process of sublimation. An alloy of copper and zinc is largely used for the making of bronze powders, as is also a precipitate of copper, obtained by inserting small bars of iron into a saturated nitric acid solution of that metal.

The article to be bronzed is first coated with *gold size*, a composition made by boiling gum anime with linseed-oil, and adding to it vermilion and a little turpentine. This is applied by means of a soft brush, and the bronze powder is then dusted over the surface of the article. When dry the surplus powder is rubbed off, and the whole polished by means of a soft leather. Solutions of gum-arabic on isinglass are sometimes used instead of gold size, and a thin solution of water glass is employed for a similar purpose.

BRONZITE is the most infusible mineral of Von Kobell's scale, being only slightly rounded at the edges in a blowpipe flame when in small splinters. It is a variety of ENSTATITE, a silicate of magnesia, but iron replaces some of the magnesia, (Mg, Fe, SiO_2) ; it is thus allied to hypersthene, with which it agrees in form (rhombic) and in some microscopic characters. It is sometimes feebly dichroic. Its structure is fibro-crystalline, lustre bronze-like, hardness 5, and specific gravity 3. It is found generally in serpentine.

BROOKE, SIR JAMES, K.C.B., Rajah of Sarawak. This enterprising English gentleman, who became the ruler of a semi-independent principality of Malays and Dyaks in Borneo, was the son of Thomas Brooke, Esq. of Witley, near Bath, where he was born in April, 1803. He was educated at the Norwich grammar-school, and entered the army of the East India Company in 1817. He served as a soldier in the first Burmese war, and was there severely wounded. Having retired from the military service after the death of his father, he spent three years in cruising about in his private yacht, the *Royalist*, a schooner of 142 tons burden, with a crew of twenty men, and conceived the project of forming a British settlement on the coast of Borneo. He undertook, at his own cost, an expedition to assist the native ruler in suppressing an insurrection, and in 1841 was made Rajah of Sarawak. He at once suppressed disorders, made an easier adjustment of taxation, and protected the poor Dyaks against the cruelty and rapacity of the Malays. In several expeditions for the purpose of suppressing piracy and slavery he was assisted by the Hon. Captain Keppel, R.N., and by Sir Thomas Cochrane, who then held command of the British fleet in Eastern waters. The result of these expeditions was the shedding of a great deal of blood; but it was shown that those who perished were freebooters and pirates, and the cruelty roused in consequence against the Rajah gradually died away. In 1847 he was created by the queen "commissioner and consul to the Native States of Borneo, and governor of Labuan," the latter being a small island near Sarawak, purchased from the sultan and erected into

a British colony. He occupied this post until 1856. In 1858 he returned to England, but had been in this country only a few months when his health received a serious shock from a paralytic attack. From this he rallied, though for some months he was incapable of active mental or bodily exertion. To add to his troubles, in the following year he heard that his books and private papers had been destroyed in an insurrection in Borneo, which he was not on the spot to quell. A public meeting was held in London, and a large sum was collected among his friends and admirers to enable him to replace them, and to purchase the estate in Devonshire where his latter days were chiefly spent. Towards the close of 1861 he paid Borneo a visit, but had the mortification of finding the north-west part of the island in rebellion. As soon as this outbreak was suppressed he returned to England, but was again recalled to the East by fresh complications in the internal administration of Borneo. These difficulties he had the satisfaction of seeing arranged on a farewell visit to the island, after which he returned to England, and died near Dartmoor, on 11th June, 1868. His published journal and letters, with the narratives of Captain Keppel, Mr. Gordon, and Mr. Charles Brooke, give the fullest information respecting the history of Sarawak. A good memoir of Sir James, entitled "The Rajah of Sarawak," by G. L. Jacob, was published in 1877.

BROOKITE. See RUFILE.

BROOKLYN. a city and seaport in King's County, New York, at the W. end of Long Island. A strait, called East River, about $\frac{3}{4}$ of a mile wide, separates it from New York city. This strait is crossed by a number of steam ferries, from which boats leave the opposite landings every four minutes during the day. In 1883 a suspension bridge, which had been thirteen years in construction, was opened between Brooklyn and New York. It cost 15,000,000 dollars, and is supported by two granite towers, 274 feet high, and 1600 feet apart. Its extreme length is 5989 feet, or more than a mile. It weighs 34,000 tons, is 85 feet wide, and 135 feet clear above the water in the centre of the span. It carries two lines of rails, two roadways, and a broad walk for foot passengers in the centre. The height of the bridge is sufficient to allow large three-masted vessels to pass under it without lowering their masts.

The site of Brooklyn is considerably elevated, and very uneven, though so much has been done in the way of grading and other improvements as to nearly overcome the original inequalities of the surface. One prominence towards the East River, denominated "the Heights," is 70 feet above the level of the sea, and affords a magnificent view of New York city and harbour. The streets are about 60 feet in width, and generally straight, intersecting each other at right angles. Many of them are beautifully shaded, which in the summer season imparts to the city all the freshness and tranquil appearance of a country town. Most of the finest streets are towards the S.W., near the bay. Many of the dwellings in this section are of surpassing elegance.

The proximity of Brooklyn to New York, its healthy atmosphere, and the facilities afforded for communication with the great metropolis, have made it a favourite place of residence for persons doing business in that city.

Brooklyn is one of the best built cities in the United States, and contains a large number of edifices that are distinguished either for elegance or architectural design. One of the most prominent is the city-hall, built of white marble. The county court house and the academy of music are also both very handsome buildings. There are 121 churches in the western and fifty in the eastern district of Brooklyn. The literary and charitable institutions are numerous, and the public schools are admirably conducted.

Prospect Park is on a beautiful site, and is well wooded with forest trees. Washington Park, made where the old fortifications formerly stood, is another fine pleasure ground.

The Atlantic Dock, a mile S. of Fulton Ferry, is one of the most extensive works of the kind in the United States. It embraces within the piers 40·86 acres, and its depth is sufficient for ships of the largest size. The outer pier, extending 3000 feet, is occupied with a range of stores, and has become one of the largest grain depots in the world. There is an extensive dry dock at the United States navy-yard, which is situated on the S. side of Wallabout Bay. The yard altogether comprises about 40 acres of ground, which is inclosed on the land side by a high stone wall, and contains, besides the residences of the officers, various workshops, and a considerable amount of military stores.

Brooklyn was first settled in 1621, near Wallabout Bay, and was then called Breuckelen. It was incorporated as a township in 1806, and as a city, having the same limits as the township, 6 miles long and 4 wide at its greatest breadth, in 1834. An Act to incorporate Brooklyn, Williamsburg, and Bushwick under one government took effect in 1855. The city now extends from Newtown Creek, including Green Point, to the boundaries of Brooklyn, below Greenwood Cemetery, a distance of $7\frac{3}{4}$ miles, and nearly 10 miles following the low-water line. The breadth is very irregular, being at the widest part nearly 6 miles, but averaging not more than $3\frac{1}{2}$ miles. It is divided into twenty wards, and governed by a mayor and a board of twenty aldermen, one from each ward, elected every two years. Population in 1810, 4102; in 1830, 15,396; in 1850, 96,838; in 1860, 266,661; in 1870, 396,661; and in 1880 it had increased to 566,663.

There are some extensive tobacco manufactories, and a large business is done in flour, sugar, and whisky, while there are manufactories for steel, brass, and copper wares, and for machinery.

Brooklyn was the scene of the battle known as that of Long Island, between the English and Americans in 1776.

BROOM, the common name for the plant *Sarothamnus scoparius*. It is a common plant throughout Western Europe, and extends through the rest of Europe to Siberia; it is found also in the Canary Isles. Broom is used for various economic purposes as well as medicinally. The seeds and the ends of the branches, either fresh or dried, are emetic and purgative; in smaller doses, diuretic and laxative; they are of value in dropsy, especially when there is heart disease. The properties are due, according to Stenhouse, to two principles—*scoparin*, which is diuretic, crystallizes in star-like tufts of a yellow colour; and *spartia*, an oily liquid, at first colourless, afterwards brownish, which is narcotic and very poisonous. The leaves of *Sarothamnus* are of three leaflets; the calyx is two-lipped; the upper lip having two and the lower three teeth; the style is long and curved, the stigma small, and the pod flat.

Dyers' broom is a name applied to *Genista tinctoria*, a plant which yields a bright yellow dye. At one time it was of great importance, but is not used at all at the present day. It grew in great abundance near Kendal, and the famous Kendal green was produced by dipping the cloth dyed yellow into a blue dye derived from woad.

The Latin word for broom is *genista*. The Hebrew word *rothem*, translated "juniper tree" in the Bible, refers to the one-seeded broom (*Genista monosperma*), still called *rothem* or *ritim* by the Arabs. It is to be met with in Palestine, in the desert of Sinai, in Babury, and in most of the countries on the borders of the northern shore of the Mediterranean Sea.

Dr. Robinson, in the "Land and the Book," when referring to Beersheba, says, "From here Elijah wandered out into the southern desert, and sat down under a shrub of retem, just as our Arabs sat down under it every day and every night. The shrubs which we had met with throughout the desert still continued. One of the principal of these is the retem already mentioned, a species of the broom plant,

Genista rotam of Forskall. This is the largest and most conspicuous shrub of these deserts, growing thickly in the water-courses and valleys. Our Arabs always selected the place of encampment, if possible, in a spot where it grew, in order to be sheltered by it at night from the wind; and during the day, when they often went on in advance of the camels,



The Common Broom (*Sarothamnus scoparius*)

we found them not unfrequently sitting or sleeping under a bush of retem to protect them from the sun. It was in this very desert, a day's journey from Beersheba, that the prophet Elijah lay down and slept beneath the same shrub."

The Spanish broom, *Spartium juncetum*, is the plant which has become so famous as the *phlata genista*, from which a famous line of English kings took the title of Plantagenet. The flowers are yellow, large, handsome, and scented. The fibre of the rush-like branches are used in the south of Europe for cordage and cloth. Its medicinal properties are similar to those of the common broom.

All these plants belong to the order LEGUMINOSÆ.

BROOM-RAPE. See ORORANCHI.

BRO'SLEY, a market-town in the county of Salop, is situated near the right bank of the Severn, 13 miles S.E. from Shrewsbury and 159 from London, being 2 miles from the Coalport station of the West Midland Railway. It consists chiefly of one long well-built street, on the summit of a hill. The town hall is a substantial brick building, the church a spacious structure in the Gothic style. Glazed tobacco pipes and fire-bricks are manufactured here, the former in very large quantities. The inhabitants are chiefly employed in the coal and iron mines of the neighbourhood. Population of the parish, 4158. Broseley was formerly known as Buwadesley.

BRO'SIMUM is a genus of plants belonging to the group ARBOREALIÆ. There are eight species, all trees with milky juice, natives of tropical America, from Brazil to Mexico and the West Indies. Amongst those best known are the BROAD-LEAF TREE, the COW TREE, and SNAKE

WOOL. The leaves are entire and feather-veined. The minute flowers are of very simple structure, being either male or female; they are attached, several together, to a stalked globular receptacle, which springs from the axils of the leaves. There are only one or two female flowers on each receptacle; they are situated at the apex, immersed in and adherent to a cavity of the receptacle. The male flowers are very numerous, covering the rest of the receptacle, which is not more than a quarter of an inch in diameter. They consist of a single stamen, surrounded generally by a cup-shaped perianth, and separated from one another by small shield-shaped bracts.

BROTHERHOODS, RELIGIOUS, lay associations instituted for purposes of piety and benevolence, which arose in great numbers during the middle ages. They prevailed most numerous in Italy, where at one period there were more than one hundred fraternities in Rome alone; but they were also common in Germany, Holland, France, and Spain. Many were formed with the sanction of the church, and received ecclesiastical support and patronage, but others were formed independently, and not a few of these were opposed by the clergy. Among the latter may be mentioned the *Beghards*, who appeared during the early part of the thirteenth century and rapidly spread throughout Europe. They appear to have been originally an offshoot of the Franciscans, but after obtaining a very indifferent reputation for about half a century, they were sharply persecuted and ultimately compelled to disperse or to join one of the regular religious orders. Another society of this description, which also prevailed during the thirteenth century, was that of the *Brothers and Sisters of the Free Spirit*. Atheism in doctrine and pantheistic in theology, they gave way to immorality and licentiousness, and in consequence were suppressed by the ecclesiastical authorities about the beginning of the fourteenth century.

Another variety of an altogether different description was that of the *Brothers of Social Life*, called also by several other names, which was founded during the latter half of the fourteenth century. Its members endeavoured to revive the state of the early church, as recorded in the opening chapters of the Acts of the Apostles, and insisted on habits of piety and industry, and a perfect community of goods among all who joined them. They were most numerous about the end of the fifteenth century, and their strict piety and zeal, their use of prayer in the vernacular, and their efforts for the spread of education, may truly be regarded as among the most important of the labours of Protestantism. Perhaps, however, the most important of these organizations are the *Brothers and Sisters of Charity*, two well-spread societies which are still in active work in the Roman Catholic Church. The order of the Brothers of Charity was founded in 1510 at Seville, by the Portuguese monk Don after wards canonized, for the cure of the sick and the rescue of fallen women. In 1572 it received from Pope Pius V. the order of St. August, and in 1624, the privileges of the mendicant order, being then divided into a Spanish congregation, having its headquarters at Granada, and an Italian congregation, having its headquarters at Rome. To the Roman congregation the societies of other nations, except Spain, are connected, the members in Europe wearing a black dress and those in America a brown one. The latter have a separate government of their own.

The *Sisters of Charity* were founded as a society in 1631 in France, by Vincent de Paul, assisted by Madame le Gras. Its objects were attendance upon the sick and the rendering of assistance to the poor. It received papal sanction in 1655, and thirty years later it numbered 221 convents. The order was suppressed and proscribed during the Revolution, but it was restored by Napoleon I. in 1807, and it now does good service in France by nursing the sick in the hospitals, and in conducting village schools.

BROTHERS, THE, a group of six or eight rocky islands outside the Strait of Bab-el-Mandeb. They are 9 miles S. of the island of Perim, and are from 250 to 350 feet above the sea-level. They are bare and rugged, and as the passage between them is very narrow they are correspondingly dangerous for navigation.

BROUGH, a market town in the county of Westmoreland, 23 miles N.E. from Kendal, and 283½ from London, being 1 mile from the Musgrave station of the North-eastern Railway. It is divided by the Helbeck, a small feeder of the Eden, into two parts, respectively designated Market Brough and Church Brough. The houses are plain, but tolerably commodious, and built of stone. The church is large, but of indifferent architecture, mostly in the late Perpendicular character; it has a square embattled western tower. There are also Dissenting places of worship. The inhabitants are principally employed in the neighbouring lead and coal mines, and the market is nearly obsolete. In the Forest of Stainmore, near this town, was erected the stone which marked the boundaries of England and Scotland, as determined by William the Conqueror and Malcolm the Scottish king. Population of the township, 1311. Its former name was *Crocolunum* or *Vertee*.

BROUGHAM, LORD HENRY, a distinguished statesman, orator, philanthropist, philosopher, and writer, was the son of H. Brougham, Esq., of Brougham, Westmoreland, and was born in Edinburgh on 19th September, 1778. He received his education at the High School and university of that city, early distinguishing himself by his studies. In fact, whilst a mere student of the university he sent papers on mathematical and physical science to the Royal Society, and gained the notice of eminent professors; while in the debates of the Speculative Society, and in the fellowship of Jeffrey, Francis Horner, and Sydney Smith, he became used to the discussion of political topics. The abolition of the slave trade and of slavery was the object which first engaged his practical efforts. He travelled both to Holland and Portugal to collect some evidence in those countries respecting the traffic in negroes. On his return he was admitted a member of the Society of Advocates. In 1802 the *Edinburgh Review* was started; and Brougham, after the third number, became its largest and most versatile contributor. He was called to the English bar by the Honourable Society of Lincoln's Inn in 1808, went the Northern Circuit, and soon obtained a large practice. On circuit, as in London, he was an energetic and powerful defender of persons charged with political offences. In 1810 he was elected M.P. for the borough of Camelford, and on 15th June of that year he moved and carried an address to the crown on the subject of the slave trade. In the ensuing session he introduced a bill, which became an Act of Parliament, making the slave-dealer punishable with imprisonment or transportation as a felon. He soon became accustomed to the new arena into which his abilities had called him. When he spoke he delivered himself with a daring vehemence and an unexampled fluency. On rolled the stream of his eloquence, strong from conviction, vehement from passion, and burning with invective, at the occasion demanded. He made flogging in the army the subject of one of his most brilliant speeches in the House of Commons in the year 1811, and in 1812 obtained the repeal of the obnoxious Orders in Council respecting the American trade. England was then at war with that country; and it is one of the noblest features of his political career that he pleaded with a generous ardour for a policy of conciliation and friendship towards it. About this time he was chosen counsel for the brothers Hunt, proprietors of the *Examiner* newspaper, when they were indicted for satirizing the Prince Regent as "a fat Adonis." A feeling of strong personal animosity to him is said to have been excited in the mind of the prince by his speech on this occasion. Brougham cherished a no less

hearty detestation for the royal profligate, which was so loudly proclaimed that it led to his being chosen the confidential legal adviser of the Princess of Wales, already separated from her husband. He lost his seat in Parliament at the general election of 1812, when he was defeated by Canning in a contest for Liverpool. After four years' absence—a period of diligent employment in his profession—he was again returned in 1816 for Winchester, and sat for that borough till 1830, when he was elected for Knaresborough, and in the same year for the county of York. He took up with greater energy than before the principal questions of reform. The holy alliance of foreign despotisms upon the downfall of Napoleon, and the suppression of constitutional liberty in Spain and Naples; the continuance of an enormous military expenditure, and of intolerable taxation, after the conclusion of the war; the accumulation of pensions and useless or excessive salaries, with the scandalous abuses in every department of the administration—were vehemently denounced by him. At the same time he demanded an inquiry into the distressed condition of the agricultural districts, and commenced the discussion of a new poor law; he proposed some amendments in the law of libel and sedition, which was then most unfair to persons on their trial for such offences; he exhibited, by a statistical inquiry, the miserably neglected state of popular education in London; and he exposed the gross misappropriation of charitable trust funds, but especially of school endowments, throughout the country. All these great objects were powerfully handled by Henry Brougham from 1816 to 1819, besides opposing the rule of the Tory government, the suspension of the Habeas Corpus in England, and other measures which were a practical negation of constitutional liberties. The death of George III., and the determination of Queen Caroline to appear in London and to assert her rights at the coronation of George IV., gave Brougham such an opportunity of making himself famous as few advocates have enjoyed. Assisted by Denman in this undertaking, he defended the cause of the queen with immense energy and courage, and his speeches in her behalf, not only at the bar of the House of Lords and in the Williams libel case at Durham, but also from his place in the House of Commons, were indeed tremendous for scathing invective and sarcasm. The king, perhaps, got no worse than he deserved. What the queen may have deserved is another matter. The popular sympathy was all with her, and Brougham, as the champion of an injured woman, stood on a pinnacle of glory.

He was more usefully occupied in his admirable labours during the next eight or ten years to promote those highest and worthiest objects of his public career—viz. the education of the working classes and the amendment of the common law and of the judicial administration. On the latter subject he made his celebrated six hours' speech in Parliament in 1828. These were, beyond all controversy, the most valuable services he ever performed for his country. Their importance cannot be too highly estimated, and the present generation owes an amount of gratitude to him for what he did in those directions, which far outweighs the perishable renown of his victories in party warfare. It is to him, more than to any other man, we are indebted for the fruits of the Charity Trusts Commission and of the Society for the Diffusion of Useful Knowledge, as well as for the law reforms consequent upon his commission of inquiry obtained in 1828; for the establishment of the county courts, superseding diverse petty and vexatious tribunals; for the realization of Dr. Birkbeck's plans of schools and mechanics' institutes; for the spread of cheap and instructive periodical literature; and for the creation of the London University. When these great and good things are enumerated and laid to his credit, in addition to his large part in the crusade, which was continued for thirty-five years, against negro slavery, till the final act of

emancipation in 1833, we feel astonished at the vast results of his beneficent activity, showing how much can be done for mankind by the industry of one man of genius, rightly and wisely applied.

Brougham became lord chancellor in 1830, and was created Baron Brougham and Vaux, and on the evening of the day on which he took his seat he laid on the table an enormous plan of law reform. He remained on the woolsack throughout the agitation of the Reform Bill, and contributed much to its success. In 1835 a change occurred, when Lord Melbourne became premier and Lord John Russell home secretary. From this government Lord Brougham was excluded, upon what grounds has never been clearly ascertained, and was never afterwards invited to join any of the numerous administrations which were formed during his lifetime. Thus kept aloof from political power, Lord Brougham devoted himself thenceforth principally to legal and domestic reforms; his subsequent life was also the chief period of his literary productiveness, although he had been making free use of his power of composition through the whole course of his political career—newspapers, reviews, and encyclopædias having been under obligations to his versatility. His principal works were "Dissertations on Subjects of Science connected with Natural Theology," "Lives of Statesmen," "Political Philosophy," "Lives of Men of Letters," "Dialogue on Instinct," "A Treatise on the Fact of the Civil Wars of England and France, the Era of the Usurper Henry and his Militant Successors," published letters, the chief one being to the Duke of Bedford on "National Education," in 1839; one to Sir James Graham, on "Law Reforms," in 1843; to Lord Lyndhurst on "Criminal Police and the Treatment of Juvenile Offenders," in 1847; on "The French Revolution of 1848," to Lord Lansdowne; and to Lord Darnley on "The Legislation of 1850." Lord Brougham's Acts and Bills with regard to the slave trade, education, law reform, and other public questions, were collected by Sir J. F. Lardley, and published in 1856, and the large and well-filled volume they make is the most fitting monument that could be preserved of his activity, perseverance, and public spirit. His last years were passed in seclusion and failing health, and his principal achievement seems to have been derived from his constant visits to Cannes in the south of France, where he had a chateau, and where he died on 7th May, 1868. In connection with the chief acts of his later life may be mentioned his able and zealous presidency of the Law Amendment Society, and its ally the Social Science Association. He was also president of the University College, London, chancellor of the University of Edinburgh, D.C.L. of Oxford, and member of the Institute of France. He married in 1819 Mary Anne Edmond, daughter of Thomas Eden, Esq., of the county of Durham, by whom he had two daughters, one of whom died in infancy, and the other at the age of seventeen. By special patent the peerage was extended to descend to the family of his brother. His collected works were published in seven volumes (Glasgow, 1868), and *Memoirs of his Life and Times*, written by himself, in three volumes (Edinburgh), 1870.

BROUGH TY FERRY. A town of Forfarshire, in Scotland, on the N. shore of the Firth of Tay, 4 miles E. of Dundee. It is a watering-place, and has fisheries for cod and other fish. Broughly Castle is built on a rock which juts out into the Tay here. It was occupied by the English in 1514, after the battle of Musselburgh, and in 1550 it was taken by the French in the Scotch service, and dismantled. It is now restored as a fortification to guard the Tay. Owing to its strong position it has been called the "Gibraltar of Forfarshire." Many Dundee noblemen have residences at Broughly Ferry. The population in 1881 was 7923.

BROSSA. See BRUSA.

BROSSONETIA. See PAPER MULBERRY.

BROWN COAL is a general term to include the varieties of recent coal formed since the coal measures of the Carboniferous period. Brown coal varies greatly according to the amount of alteration it has undergone, but it generally has a specific gravity less than true coal, and is not so hard. It occurs in strata of almost every post-Carboniferous period. In New South Wales it is found in the Permian, at Brora in Sutherland, and in Yorkshire, in Jurassic beds; in North America, west of the Rocky Mountains, there are Cretaceous coals, and also Tertiary coals. At Bovey Tracey the lignites are of Oligocene or Miocene age; at Waigat, near Disco, Greenland, and at Cape Murchison, in Grinnel Land (81° 10' N. lat.), beds of coal of Miocene age have been found as good as much altered as ordinary Carboniferous coal, and containing plant remains, indicating a sub-tropical climate. The varieties of brown coal form the connecting series between peat and true coal. In peat the series graduates from the growing plants, through "white turf," in which the original fibres are scarcely altered, to "brown" and "black," or "stone turf," some specimens of which are more dense and more altered than many lignites. In brown coal the series is continued from lignite to true coal, as the Grinnel Land coal (specific gravity, 1.33), which is a true coal in every particular excepting age and fossil remains. The series of alterations that have produced this appear to be the result of the decomposition of vegetable matter out of contact with air.

BROWN HEMATITE. See IRON ORE.

BROWN SPAR, used synonymously with BIRLIN SPAR, but sometimes also applied to CHALYBITE.

BROWN, CAPTAIN JOHN, a celebrated American abolitionist, and the leader of the famous Harper's Ferry insurrection, was born at Torrington, Connecticut, 9th May, 1800. Originally intended for the ministry, he was compelled to relinquish his studies owing to an affection of the eyes, and he became subsequently a tanner, a dealer in wool, and a farmer. A determined abolitionist, he went to Kansas in 1855 with his four sons, determined to oppose by all means in his power the establishment of slavery in that territory. In the border warfare which ensued between the slavery party from Missouri and the free settlers he took a prominent part, and in one engagement lost a son. After the settlement of the dispute in Kansas he went east, speaking publicly against slavery and advocating an insurrection of the slaves as the speediest means for its suppression. In October, 1859, he made an attempt to carry out this scheme by making an attack upon the arsenal of Harper's Ferry, where an immense quantity of arms were stored, at the head of a party of seventeen white men and two negroes. The arsenal was captured by a bold night attack, and the next day a number of the principal inhabitants were seized as hostages. The slaves, however, did not, as had been anticipated, join the people of the town, which by about 1500 of the militia from the surrounding country made an attack upon the arsenal, and after some loss of life, quelled it. Brown, severely wounded, being taken prisoner. He was tried for high treason, and hung 24th Dec. 1859. A brave, honest enthusiast, his conduct has exerted a powerful influence in the United States, and has created a new era. He said before his death that he could best serve the cause he had at heart by being hanged, and during the war between the North and South, his name became one of the most popular of the soldiers of the Northern soldiers—

"John Brown, be thou, in our memory,
But his only our general name."

—Glory Hall, &c.

BROWN, JOHN, M.D., LL.D., was born at Biggar on 22d September, 1810. He was educated at the High School and University of London, and after serving an apprenticeship with Mr. (afterwards Professor) Syme, he spent a year as a student in Edinburgh. The year

of his stay there was marked by an outbreak of cholera, and the zeal and courage displayed by the young surgeon proved of great service, and attracted the favourable attention of Charles Dickens. In 1833 he returned to Edinburgh, graduated as M.D., and began to practise as a physician. He devoted his leisure to literature, and contributed numerous articles to the *North British Review*, which, with other papers, were collected and published in two volumes, entitled "Home Subseivæ," in 1858 and 1861. One of his stories, entitled "Rab and his Friends," has been many times republished, and it still enjoys a well-deserved popularity. His writings are marked by a quaint fancy, pure and tender pathos, and a bright genial humour. He died 11th May, 1882.

BROWN, ROBERT, the founder of the sect of "Brownists," who afterwards, under John Robinson, became the Independents or Puritans, was the son of Anthony Brown of Toilethorpe, Rutland, and was born in 1550. He was educated at Corpus Christi College, Cambridge, and while a young man became a schoolmaster at Southwark and chaplain to the Duke of Norfolk. Soon after 1571 he began publicly to declaim against the polity and liturgy of the Church of England, and gaining many followers, he was called upon to appear before the Bishop of Norwich. He was committed to prison, but was released on the intercession of the Lord Treasurer Burleigh, to whom he was related. He then passed over to Holland, where at Middleburg he formed a church after his own ideas. He left Middleburg for Scotland in 1584. While at Edinburgh he endeavoured to set the session of the kirk of Edinburgh right on a few points of doctrine and practice wherein his ideas differed from theirs, with the result that "he was committed to waid a night or two till his opinions were tried." Released soon after, he returned to England and fixed his residence at Northampton, and again endeavoured to gain proselytes by assailing the Church of England. For this he was visited with the penalty of excommunication, and had to retire to his father's house at Toilethorpe. While there certain proposals were made to him, which resulted in his professing repentance for his conduct, and, on receiving absolution, entering the Church, soon after which he was presented with the wealthy living of Achurch, near Oundle in Northamptonshire. From this time he was silent; he never officiated at Achurch, contenting himself with consuming his tithes in silence. Having struck the constable of his parish for demanding a rate of him, he was committed to Northampton gaol, where he died in 1630, aged eighty.

His followers, who denied the Church of England to be a true church, and who found equal fault with the Presbyterians, insisted on the most democratic form of church government possible. All power was vested in the members, who appointed their own officers or pastors, and who retained the power of reducing them from their offices at any time. They rejected all forms of prayer, and would not even use the Lord's Prayer in public worship. Any member might exhort, or after service call in question the teaching of the preacher. After remaining united for a few years only the society divided into Separatists and Independents, the former soon after becoming merged in the latter.

BROWNE, SIR THOMAS, author of the "Religio Medici" ("Religion of a Physician"), is one of those authors who will appeal to a cultivated taste as long as there are any readers of our language. In some respects—as to sonorousity of language, for example—Sir Thomas Browne's prose can hardly be paralleled. Add to this his great learning, the quaintness of imagery which he inherited from the Elizabethans, and the unconscious self-delineation of his fine character—lovable even in its weakness—and it is not wonderful that his admirers feel an almost personal affection for him. His fault is love of new-coined words from the Latin.

Thomas Browne was the son of a rich merchant of London, was born there in 1605, educated at Winchester, and brought up to medicine at Oxford. He took his doctor's degree at Leyden in 1633. On his return to England he practised as a physician at Halifax and Norwich. His "*Religio Medici*" was published in 1643, and though it appeared in that time of civil discord (Charles had raised his standard at Nottingham the year before), it at once gained the public ear and was eagerly read. Three years later he published his "*Vulgar Errors*," a most entertaining account of the fictions firmly believed in his day—the phoenix, the identity of crystal with ice, the fatality of spilled salt, &c. His finest work is undoubtedly, however, his "*Hydriotaphia*," or "*Urn-burial*," published in 1658. It was suggested by the discovery of some sepulchral urns in a field, witnessed by Sir Thomas Browne; but he uses this rather as a peg whereon to hang his weighty observations on shortness of life, on posthumous fame, &c., than as interesting in itself. The conclusion of this little work is (says Thomas Carlyle in his "*Diary*") "absolutely beautiful; a still, elegiac mood—so soft, so deep, so solemn, so tender, like the song of some departed saint flitting faint under the everlasting canopy of night. Browne must have been a good man." A fanciful essay on the gardening of the ancients and moderns, and the mystical properties of the number 5, called the "*Garden of Cyrus*, or the Quincunxial Lozenge," followed shortly. In 1666 he presented some fossil bones, with a memoir, to the Royal Society. Charles II. visiting Norwich, knighted him in 1667; and Evelyn, the diarist, who accompanied the king, goes into raptures over the doctor's cabinets of curiosities. He died on his birthday, 19th October, 1682.

BROWNEA is a genus of plants belonging to the order LEGUMINOSÆ. The species belonging to this genus are very beautiful stove-plants. *Brownea grandiceps*, the Rosa del Monte of South America, is a small evergreen tree, covered with clusters (8 inches in diameter) of crimson flowers, full of long silky crimson stamens. The leaves are a foot long and more, pinnate, with about twelve pairs of leaflets. During the day they droop over the flowers to protect them from the tropical sun, but in the evening they rise and allow the dew to reach them. *Brownea coccinea* is noted for its rich colour. It was introduced from Jamaica in 1793.

There are eight species of *Brownea*, all trees, and natives of tropical America. The five petals are only slightly unequal; the sepals and bracts are generally coloured, greatly adding to the beauty of the flowers; the ovary is stalked, with the stalk adherent to the tube of the calyx.

BROWNING, ELIZABETH BARRETT, a poetess and wife of a poet, was born about 1805 at Hope End, near Ledbury, Herefordshire, the country seat of her father, an opulent West India merchant. At the age of fourteen she wrote her first published poem, "*The Battle of Marathon*." But she herself says:—"I wrote verses at eight years old and earlier"—verses which she had too much good taste ever to show. Her first publication was an essay on "*Mind*," a didactic poem, written when I was seventeen or eighteen, and long repented of as worthy of all repentance," and published in 1826. Her next literary enterprise (1833) was a version of the "*Prometheus Bound*," translated from the Greek of Æschylus. Her next volume of verse was "*The Seraphim and other Poems*" (London, 1838). After many years of bad health, during which, however, she wrote "*Lady Geraldine's Courtship*," she married Mr. Browning in 1847. They took up their residence in Italy, whence Mrs. Browning issued in 1851 her poem, "*Cas di Guido Windows*." Her latest poem, "*Aurora Leigh*" (1856), received the honour of a second edition with a rapidity which proved the wide circle of her readers. Mrs. Browning died in 1861, and left a name which will always rank high in the roll of English poets.

Mrs. Browning is probably, though with many faults, the greatest poetess England has yet produced. Her "*Sonnets from the Portuguese*," if, indeed, they are not purely productions of her own brain, may be taken to represent her own feelings during her courtship by her husband, and are perfect gems both of sentiment and language. It is probable Mrs. Browning wrote rapidly and in high enthusiasm; had her revision been stricter probably her fame would be more enduring. But her freshness, tenderness, purity of thought, and noble sympathy with those who suffer wrong or misery, will always secure her readers.

BROWNISTS. See BROWN, ROBERT.

BRUCE, JAMES, a celebrated traveller, born at Kinnaird, in Stirlingshire, 14th December, 1730, was the eldest son of David Bruce, Esq. of Kinnaird. When eight years of age he was sent to London to school for three years; he then removed to Harrow, where he remained till 1746; and he finished his education at the University of Edinburgh. He travelled, in 1757, through Portugal, Spain, France, and the Netherlands, and in 1758 he returned to Scotland to succeed to the family estate. At the beginning of 1762 Lord Halifax appointed Bruce consul-general at Algiers, with the understanding that he was to visit the interior of Barbary.

Bruce set out for his consulate by way of Italy, and early in 1763 he arrived at Algiers, where he remained about two years. During his stay at Algiers he learned the rudiments of surgery from the consular surgeon. In May, 1765, a successor was appointed, on which arrival Bruce left Algiers and commenced his travels through Barbary, which lasted from September, 1766, to February, 1766, of which he has given an account in the introduction to his travels. He next proceeded to Syria, after having been first wrecked at Feleneta in Cudi, and also attacked there by an intermittent fever. He remained for some time at Aleppo, and in June, 1768, proceeded to Egypt, where, at Cairo, he first fixed his plan for going to Abyssinia. He obtained letters from Ali Bey, the Mameluke chief, and from the Patriarch of Alexandria, and set off in 1769, crossing the desert to Cossair, and thence embarking for Jidda. Bruce was two years in Abyssinia, of which he has given an interesting account in his "*Travels*," though the accuracy of many of his statements has been impugned. He visited Axum, Gondar, and one of the sources of the Nile. The details of his journey must be sought for in his own work. In December, 1771, he obtained permission, with some difficulty, to leave Abyssinia, and proceeded by Ras el Fiel and Beshah to Sennar, where he arrived in May, 1772. Here he was detained till September, and then proceeded northwards by Herbihi, Hala, Shendi, and across the Atharion, Tazaze, to Gozz, in the Barbary country, to the desert, which he was a fortnight in crossing to Assouan, and in which he was nearly losing his life. He left Assouan in December, and after resting some time at Cairo, embarked at Alexandria, in March, 1773, for Marseilles. In France he was received with attention by Buffon and other distinguished men. He thence went to Italy, and returned to England in June, 1774, after an absence of twelve years.

After some months spent in London he retired to his estate in Scotland, where he married, in May, 1776, Miss Dundas, who died in 1785. After this loss he set about preparing his travels for publication. This work, "*Travels to Discover the Sources of the Nile, in the years 1768-73*," was published in 1790, in five 4to volumes. Bruce will always rank high among African travellers, and his journey to Abyssinia forms an epoch in the annals of discovery; for he may be said to have rediscovered a country of which no accounts had reached Europe for nearly a century. His courage, activity, and purity of mind are deserving of the highest praise. Bruce died on the 27th of April, 1791, at Kinnaird.

BRUCE, ROBERT, King of Scots, was born on the 21st of March, 1274. He was grandson of Robert de Brus, the seventh Lord of Annandale, through whose mother, Isabel, second daughter of David, earl of Huntingdon, and co-heiress of David I. of Scotland, the Bruces derived their claims to the throne. Robert de Bruce, his father, in 1271 married Margaret, countess of Carrick, in whose right he became Earl of Carrick, and by her he had twelve children, of whom Robert Bruce was the eldest son.

The competition of his grandfather for the throne has been noticed under BALLIOL. After the decision of Edward I., both his father and grandfather withdrew into England, and to a retired life; but Robert Bruce pursued a rather equivocal course—sometimes swearing fidelity to Edward, and sometimes joining the national party. The victory of Wallace at Stirling, in 1297, induced Bruce to declare himself more openly, but he did not join himself to Wallace; and, though he held Ayr Castle against the English, he there locked on while Wallace was defeated at Falkirk, and in 1300 he surrendered himself and made his peace with England.

His submission of Bruce, however, appears to have been of short continuance; and, seeing no hope of Balliol's restoration, he formed the resolution of restoring his country to independence. Accordingly, while actually engaged in assisting Edward in the settlement of the Scottish government, he entered into a secret bond of association with the Bishop of St. Andrews and with Comyn, who betrayed the latter to Edward; and only by the friendship of the Earl of Gloucester, who sent him in haste a piece of money and a pair of spurs, was Bruce enabled to escape the revenge of Edward. He was then in or near London. In five days he reached Lismore Castle, and thence repaired to Dumfries, where Comyn was, he sought a private interview with him, and the meeting took place in the convent of the Minors Friars. Here Bruce, passing, satily reproached Comyn for his treachery, and after some altercation drew his dagger and stabbed him to the heart. His uncle, Sir Robert Comyn, assisted in the sad tale that ensued. He soon afterwards proceeded to Scone, the ancient seat of Scottish magnanimity, and was there crowned King of Scots on the 27th of March, 1306.

Edward I., who was fully prepared to repress this usurpation, as he called it, of Bruce, He collected an army, he collected knights and on his own and 400 other youths, and he sent a solemn decree to excommunicate upon Bruce and his adherents. Bruce, on the other hand, had prepared no plan of offensive warfare, or even of defence. He was opposed by the Earl of Pembroke at Methven, and was finally driven through the heart of Scotland till he was obliged to face the rebel of Bannockburn on the north coast of Fife, where he remained during the winter.

On the approach of spring Bruce marches to aid Robert Bruce, and descends upon the coast of Carrick, which was in the possession of the English; and, finding the troops under Pembroke closely entombed, they rushed in amidst them and routed the whole body, consisting of about 200 men, to destruction. This success was balanced, however, by the capture of Bruce's two brothers at Loch Ryan, in Galloway, where the whole party were routed, several persons of note slain, and the two brothers of Bruce taken prisoners and conveyed to the execution. Bruce wandered among the fastnesses of Carrick during some time; he is said to have been tracked by his enemies, and to have owed his safety only to his own personal strength and courage, which enabled him to slay fourteen of his pursuers with his own arms, and effect his escape. The danger to which Bruce had been exposed, and the bravery which he had manifested on this occasion, raised the spirits of his party and called every man to his standard. He was then successful in many attacks on detached parties of the English army, and encouraged by success ventured down upon the low coun-

try, and reduced to his obedience the districts of Kyle, Carrick, and Cunningham. Pembroke thereupon, putting himself at the head of a body of cavalry, advanced into Ayrshire, and came up with the army of Bruce when encamped on London Hill. Here, though his army was greatly inferior to the English, and consisted wholly of infantry, so well was the conflict conducted by Bruce that while the loss of the Scots was extremely small, Pembroke's whole forces were put to flight. Three days after this Bruce encountered Montferrmer at the head of a considerable body of English, whom he also defeated with great slaughter. These successes were still further strengthened by the death of Edward, who died at Burgh on the Sands, in Cumberland, on the 7th July, 1307. With his last breath he commanded that his body should accompany the army in its march, and remain unburied till the country was wholly subdued. But his son was incapable of conducting the enterprise which had devolved upon him, and after a useless and inglorious campaign he retired from the contest. For three years after this Bruce had to contend with the governors despatched by Edward, and with his other enemies in different parts of Scotland. He triumphed over all, and early in the year 1310 was acknowledged by the clergy and the kingdom as the king of Scotland.

Finding at length his authority established at home, and that Edward was sufficiently employed by the dissensions which had sprung up in his own country, Bruce resolved by an invasion of England to retaliate in some measure the miseries which it had inflicted on his kingdom. This he did, twice ravaging the border counties, and giving up the whole district to the unbounded license of the soldiery. In 1314 he took various fortresses in his kingdom which had hitherto remained in the possession of the enemy, the last of which was the castle of Stirling, and for the relief of which the famous battle of Bannockburn was fought, 24th June, 1314, [see BANNOCKBURN], when a complete victory was obtained by Bruce. By this event the title of Bruce was established, and the remainder of his public life was occupied in invading and defending himself from England, in negotiating treaties with that kingdom, and framing laws for consolidating the power which he had acquired.

The hardships and sufferings Bruce had encountered brought upon him a disease, in those days called a leprosy, and the last two years of his life were spent in comparative seclusion in a castle at Cardross, on the northern shore of the Firth of Clyde. He died on the 7th June, 1329, in the fifty-fifth year of his age, and twenty-third of his reign. His body was interred in the Abbey Church of Dunfermline; his heart, inclosed in a silver case, was intrusted to his friend, Sir James Douglas, to be buried in Jerusalem. Douglas fell in Spain fighting against the Moors, and the heart was brought back to Scotland and buried in the monastery of Melrose.

BRUCEA, a genus of plants named in honour of Bruce, the traveller in Abyssinia, belonging to the order SIMPLIFLORA. *Brucea antidysenterica* is a native of Abyssinia, and is said to be a tonic and astringent, and to act favourably in dysentery. *Brucea sumatrana* is a native of Sumatra, the Moluccas, China, and Cochin-China. The leaves are intensely bitter, and possess the same medicinal properties as *Brucea antidysenterica*. There are five species belonging to this genus, natives of tropical Africa and Asia. They are all trees, possessing bitter properties, with alternate compound leaves and minute flowers arranged in small stalked clusters on a long axis (*rachis*). The parts of the flower are in fours, and there is a four-lobed disc; there is one ovule in each cell of the ovary; the styles are free or connate at the base.

BRUCHIDÆ is a family of BEETLES of the section TETRAMERA and group RHYSCHOPHORA. The body of the perfect insect is oval, the head is bent downwards, and is prolonged into a short broad *rostrum* or snout. The

antennæ are straight and slender, and are serrated on the inside; the elytra do not cover the abdomen; the femora of the hind legs are very thick, and are often toothed on the under side.

The members of this family deposit their eggs in the yet tender germ of various leguminous plants; the seed becoming matured is devoured by the larva, which lives entirely within the seed, where it undergoes its metamorphosis. The holes so often observed in peas and other seeds of a similar nature are those formed by the perfect insect to effect its escape; after which it is generally found in the flowers. From the habits of these insects, as above related, it may easily be conceived that when numerous they become exceedingly destructive. *Bruchus pisi* is a native of our own country (having been most probably introduced in the seeds of the pea), but fortunately it is not sufficiently abundant to do much mischief. It is common in the United States and Germany. The figure shows the per-



Bruchus pisi.

fect insect and larva of *Bruchus pisi*, much magnified, together with two peas and a bean attacked by it. *Bruchus granarius* is also a native of this country, and is found among beans, vetches, and other seeds, the holes of which it devours. It very much resembles *Bruchus pisi*, but is rather smaller. Species of the genus *Caryoborus* are found in South America. They attain a great size, and infest the nuts of palm-trees.

BRUCINE or **VOMITINE** ($C_8H_7N_3O_4 + 11H_2O$) is a very poisonous vegetable alkaloid found accompanying strychnine in nuxvomica, the seed of *Strychnos nuxvomica*, and in St. Ignatius' bean (*Strychnos ignatii*). It is obtained in small crystals from boiling water. Its action resembles strychnine, from which it is easily distinguished by strong nitric acid, which imparts a deep red colour to brucine, changed to violet by protochloride of tin. It forms salts with all acids.

BRUCITE is a hydrate of magnesia found in veins in serpentine, in white, gray, or greenish hexagonal prisms or plates, which separate into thin translucent laminae that are flexible but not elastic. It has a pearly lustre, a hardness of 2.5, and specific gravity of 2.3. There is a fibrous variety (*neulite*), the fibres of which are elastic.

BRUGES (*Brugge*), capital of the Belgian province of West Flanders, is situated 12 miles from Ostend and 60 from Brussels. The population is 41,500.

The streets are neat and clean, but have a deserted appearance. The houses are mostly large and well built; many of them have an appearance of grandeur which attests the opulence of their former inhabitants. The city is divided into seven parishes. The most notable public buildings are the Church of Notre Dame, which has a tower 400 feet high, and contains in one of its chapels the beautiful gilded statues of Charles the Bold and his daughter, wife of Maximilian; the Hospital of St. John, in which are Hendrik's finest pictures; the cloth and flesh markets (the *Halles*), built in 1364, over which rises to a height of 348 feet the famous Belfry of Bruges, the subject of Longfellow's poem "The Belfry of Bruges," with the finest

peal of bells (forty-seven) in Belgium; the Gothic Town hall, of date 1377, now the repository of a public library of 15,000 volumes and 580 MSS.; the Craenenburg, now a tavern, where the Archduke Maximilian was imprisoned for six weeks in 1488; the Exchange, which is the oldest in Europe; and the palace of the counts of Flanders, built in 1531, now used as archives. Bruges also contains an atheneum, a school of navigation, a museum, a botanical garden, a cabinet of natural history, and an academy of fine arts. The trade of the city is facilitated by canal and railroads, which communicate with various important towns of Holland, Belgium, and France. The canal from Ostend allows the passage from the sea to Bruges of vessels of 500 tons burden. There are, besides, a wet dock and a dock for the building and repair of vessels, and warehouses for receiving goods in contempt. The manufactures of Bruges now consist of linens, lace, woollen and cotton goods, salt, refined sugar, earthenware, paper, distilled liquors, and other minor branches of industry. Bruges is destitute of spring water, so that the inhabitants are obliged, as were their ancestors in the time of Plato, to have recourse to supplies from the clouds. For this purpose every house is provided with a cistern for collecting rain from its roof; and that which gathers in the ditches of the ramparts is conveyed by means of hydraulic machinery to public fountains and tanks, whence it is distributed in pipes throughout the city.

The town is intersected in every direction by canals, the numerous bridges over which give rise to its name—*Brugge* in Flemish. Bruges is a very ancient place. In the seventh century it held the rank of a city, and retained its greatest prosperity at the beginning of the thirteenth century, by which time it had over 200,000 inhabitants. The splendid court of the dukes of Burgundy was then held at Bruges, and there also resided many a twenty-four ambassador. The city was specially famous for its silk and linen fabrics; while, in order to encourage the perfection to which the wool-manufacture had been carried in Bruges, Philip the Good in 1430 instituted the order of the Golden Fleece. At the French conquest the ostentatious duke of Burgundy, who cherished and maintained his exemption from paying a tenth, proceeded to the recognition of God, a sumptuous splendour of pageantry was displayed, which no European monarch could rival, and an able but never was exercised a whole new one dispute. The records of the number of guests and the amount of this period are most incredible. Not only the dresses of men and women, but the harness of the horses, were of velvet, satin, and gold, profusely spangled with brilliant jewels—an extravagance which Charles V., in the following century, was obliged to suppress by enacting sumptuary laws. The wealth and splendid attire of the citizens of Bruges had long been subjects of wonder; for when the queen of Philip le Bel, of France, visited this city in 1300 she is said to have exclaimed with astonishment, "I here see hundreds who have near the appearance of queens than myself." The public and private buildings of the city were worthy to display such courtly magnificence; so that Soutley, judging from the existing architectural remains of that ancient grandeur, says, in his "Pilgrimage to Waterloo":

"When I may read of tilts in days of old,
Of tournaments graced by chiefs of renown,
Fair dames, brave citizens, and warriors bold—
It fancy would portray some stately town
Which of such pomp fit theatre might be,
Lair Bruges! I shall then remember thee."

This noble city, throughout the fourteenth and fifteenth centuries, was the central emporium of the whole commercial world, and had resident consuls and merchants from every kingdom in Europe. In the Hansatic League, or confederacy of the great European ports for the promotion

of commerce, Bruges was the leading city, and the grand depot of naval stores. Her quays were crowded with foreign ships and merchants, and her piles of magnificent warehouses were filled with the wool of England, the linen of Flanders, and the silk of Persia. Her weavers were celebrated for making the most beautiful description of tapestry more than a century before the Gobelin manufacture was commenced under the direction of their descendants. The wealth of the citizens, of course, was enormous; a single merchant gave security for the ransom of Jean sans Peur, the last count of Flanders, to the amount of 400,000 crowns of gold. The annual exports merely of stuffs manufactured from English and Spanish wool amounted to 8,000,000 florins, and the florin was then quadruple its present value. In 1488 the citizens rose against the Archduke Maximilian, and placed him in confinement. For this act fifty-six of them were condemned to death by the emperor, and a great number banished; the city was deprived of its privileges, and subjected to a heavy fine. From this time Bruges lost its commercial importance, which was in great part transferred to Antwerp, and the religious persecution and brutal ferocity of the Spanish, under Philip II. and the Duke of Alva, at the end of the sixteenth century, completed the process of its ruin by compelling its artisans to escape for their lives to England, where they found a hearty welcome from Queen Elizabeth, and who thus became the means of establishing the woollen manufactures for which this country has since become so distinguished.

BRUGG or BRUCK, a village in the canton of Aargau, Switzerland, on the Aar, about 9 miles N.E. of Aarau. Near to it is the Abbey of Königsfelden, founded by the wife and daughter of the Emperor Albert, who was murdered on this spot. In ancient times Brugg was the site of the most important settlement of the Romans in Helvetia. It was known as *Vindonisa*.

BRUN, CHARLES LE, the son of a sculptor of Scotch extraction, was born at Paris in 1619. The singular merit of his juvenile sketches attracted the attention of the Chancellor Seguier, who placed him with Vouet, and afterwards with Nicolas Poussin. He remained in Italy six years. On his return to Paris in 1648 he was received into the Academy. Having attained the highest rank in the Academy at Paris, he was appointed principal painter to the King, was invested with the order of St. Michael, and was ultimately named Prince of the Academy of St. Luke at Rome, although absent. Andrian's engravings of Le Brun's great series of Alexander's battles are works of as great reputation as the paintings which they reproduce. In fact Le Brun, though always meritorious, is too much wanting in the divine fire to be attractive to modern eyes. He died in the year 1690. He is somewhat unjustly depreciated at present. His wife was also a painter, and has left some excellent works.

BRUNANBURH. In the year 937 King Athelstan, grandson of Alfred the Great, and successor of Edward the Elder, led a hard struggle for English liberty. He and his brother Edmund (afterwards king, with the surnames of "Edmund the Magnificent") had to fight five armies at once. Danish Anlaf was joined by the Scots under Constantine, by the Cumbrans under Owen, by the Welshmen and the English-Danes. The Saxon chronicle breaks out into verse in reciting the glorious fight and victory of Brunanburh. It is the first of these fine poetical old English episodes in the chronicle, and is very striking. Mr. Freeman ("Old English History") gives it, just so slightly modernized as to be easily readable. It begins—

"Now Athelstan king,	Eld-long glory
Of Earls the Lord,	Won in the fight
To warriors the ring giver;	With the sword's edge
And his brother's kins,	By Brunanburh," &c.
Edmund Atheling,	

The fine metre and delicate ALLITERATION (described in the article of that heading) are of course lost in making the necessary changes into modern English. We no longer know where Brunanburh was. It was probably somewhere in what we now call Northumberland. But it was a most important fight. Five Danish kings, seven earls, and the son of the King of Scots were killed; Anlaf and King Constantine hardly escaped. Edmund, at the beginning of his reign, was able indeed, from the prestige of Brunanburh, to win back from the Danes the five boroughs of Mercia—Leicester, Lincoln, Nottingham, Stamford, and Derby—celebrated in the chronicle by another burst of song; and for a time the Danes kept within their boundary line, drawn diagonally across the kingdom, and there was peace in England.

BRUNCK, RICHARD FRANÇOIS PHILIPPE, was born at Strasburg on the 30th of December, 1729. He was educated by the Jesuits in the College of Louis le Grand at Paris. An early engagement in the affairs of active life suspended his taste for literature, he being employed in the Seven Years' War as military commissary. He had attained his thirtieth year, when, during a residence in winter quarters at Giessen, he happened to lodge in the house of a professor, who revived in him a love for letters. On his return to Strasburg he devoted himself to study, to which the possession of an easy fortune allowed his entire application; and the professor of Greek whose lectures he attended being a profound grammarian, Brunck quickly became well versed in that language. His first work was an edition of the Greek Anthology, published under the title of "Analecta Veterum Poetarum Græcorum" (Strasburg, three vols. 8vo, 1776), which contains, besides the epigrams usually given in an anthology, several of the minor Greek poets, Anacreon, Callimachus, &c., entire. Anacreon appeared in a separate edition in 1778. His favourite author, Apollonius Rhodius, employed him in 1780, and was followed in 1783 by an Aristophanes, which has since been entirely superseded by other editions. In the year following he prepared the fragments of Theognis, Solon, Simonides, and other didactic and moral Greek poets, under the title of "Ethikè Poësis, sive Gnomiæ Poetæ Græci" (one vol. 8vo). In 1785 he issued an edition of Virgil, in which he was by no means sparing of the established text. His Sophocles, which appeared in 1786, is the work upon which his reputation is chiefly founded. Subsequent critics, however, have found plenty to do with Sophocles, and one part of their business has been to restore the MS. readings which this daring editor had replaced by his conjectures. He prepared a copy of Plautus for the Bipont edition of the classics in 1788. Reverses of fortune, produced by the public troubles of the great Revolution, obliged him in 1791 to dispose of part of his library, and in 1801 of the remainder. His taste for Greek literature became extinct with the loss of the first portion of his books, of which he never spoke without tears. He still, however, retained some fondness for the Latin poets. In 1797 he printed an edition of Terence. He died on the 12th of June, 1803.

BRUNEL, ISAMBAR KINGDOM, was son of Sir Mark Isambard Brunel, the celebrated engineer and designer of the Thames Tunnel. He was born at Portsmouth in 1808, whilst his father was engaged in constructing the block machinery for the dockyard. He was educated in France, and commenced practical engineering in 1826, by assisting his father at the Thames Tunnel, of which work he was resident engineer. Being the last to quit his post, he was more than once in danger, owing to the frequent breaking in of the water during the progress of the extensive excavations, and only saved himself by swimming. Mechanical and railway engineering were his special objects of study. He was designer of the *Great Western*, the first steamship built to cross the Atlantic, of the *Great Britain*, and also of the wonderful but unfortunate *Great*

Eastern. Mr. Brunel, however, will be longest and best known as the engineer of the Great Western Railway, to which situation he was appointed in 1833, and under his direction all the tunnels and bridges on that line and its branches were constructed. Noticeable among the bridges are that across the Thames at Maidenhead, for the largest and flattest of brick arches; that at Clapton, for the great difficulties overcome in crossing the Wye; but most especially that great triumph of engineering skill, unsurpassed by anything of the kind in the world, save that over the St. Lawrence in America, the bridge on the Cornwall Railway over the Tamar at Saltash, near Plymouth, opened by the late Prince Consort in 1859. [See BRIDGE.] Amongst the tunnels, that at Box, near Bath, about 3 miles in length, is the most remarkable. The old foot suspension bridge across the Thames at Hungerford, which in 1864 was removed to Clifton, near Bristol, was erected by Mr. Brunel, and had at the time the longest span in England. [See CHARING CROSS BRIDGE in article BRIDGE.] He also took part with the late Mr. Robert Stephenson in building and raising the Conway and Britannia Tubular Bridges. Abroad he constructed the Tuscan portion of the Sardinian Railway; and during the Crimean War he had the entire charge of establishing and fitting the Red Cross hospitals in the Dardanelles. Mr. Brunel was elected a fellow of the Royal Society in 1830, and chosen one of the council in 1844. He also held the office of vice president of the Institute of Civil Engineers and the Society of Arts, and was Chevalier of the Legion of Honour. He died of paralysis in September, 1859. A statue of him was erected on the Thames Embankment in 1877.

BRUNEL, SIR MARK ISAMBARD, an engineer whose name has become celebrated in the annals of art from his wonderful skill in executing the Thames Tunnel, which, under great difficulties, he conducted from the Middlesex to the Surrey side of the river. He was a Frenchman by birth, and born at Haequeville, in Normandy, in 1769. Though originally intended for the church, his predilection for the physical and mathematical sciences became so strong that his original destination was relinquished, and he entered the royal navy, made several voyages to the West Indies, and returned home in 1792. At this time the French Revolution was in its zenith, and he quitted France for the United States, when necessity fortunately obliged him to pursue the natural direction of his mind, and to adopt the profession of a civil engineer. Here he was engaged in many important works; but having determined on visiting England he offered his services to the British Government, and was eventually employed in Plymouth Dockyard to carry into operation his newly-invented plans for making ship-blocks by machinery. His scheme at first met with the strongest opposition; but its many advantages have since rendered its adoption universal. At the time of its introduction he selected Mr. Henry Maudslay, an engineer of Lambeth, to assist in the execution of the work; and thus was laid the foundation of one of the most extensive engineering establishments in the kingdom. As a remuneration for his success in this unparalleled work, Brunel asked the saving of one year, £20,000. He received two-thirds. Besides the circular saw, Brunel now introduced the circular knife, increasing thereby many fold the economy of veneer cutting. But he met here with most violent and successful opposition from the trade. Amongst other works of a less striking character, yet sufficient to have raised any other man to the highest position in his profession, may be enumerated a suspension bridge, so admirably constructed as to resist the hurricanes of the East; the application of condensed carbonic acid gas as a moving power; the construction of an arch of large span without centering; the introduction of those strong, light, and economical roofs now common at our railway stations; and the masterly arrangement at Chatham for the prepara-

tion of timber for the construction and repair of shipping. This beautiful arrangement displays in a remarkable manner that singular comprehensiveness and simplicity of design, with elaborateness of detail, which so strongly characterize all Brunel's labours. The first double-acting marine steam engine was Brunel's invention—an engine which gave such umbrage to the good people of Margate in 1816, upon the occasion of the first trial trip, that common civility was denied to all connected with the vessel, and a night's lodging absolutely refused to the ingenious inventor at the hotel. On the conclusion of the war with France, Brunel received a visit from Alexander of Russia, when he submitted to the emperor a plan for making a tunnel under the river Neva, on which St. Petersburg is built, the erection of a bridge being attended with great difficulties, owing to the vast accumulations of ice and the suddenness with which it breaks up on the termination of winter. This scheme was not carried into effect; but it originated his great plan for the formation of a tunnel under the Thames, which, after many difficulties, was completed and opened in 1843. For his great engineering talents Mr. Brunel received the honour of knighthood in 1844. He died December, 1849.

BRUNELLESCHI, FILIPPO, if he had no other claims to notice than those arising from a single work, the dome of Santa Maria del Fiore (the cathedral) at Florence, would rank with the greatest names in architecture. The Duomo had stood for a century and a quarter unroofed as to the great central space. At first Brunelleschi's plan was laughed at; but his triumph was generously admitted, and he died just as his great work was completed, surrounded with the greatest honour from his admiring countrymen. The dome still remains the largest in span in the world. It is not circular, but octagonal in plan. The architect spent a long time of study amongst the fine Roman remains of arches and domes of the ancients before he decided upon his design. Michael Angelo was always ready to admit the consummate genius of Brunelleschi. Indeed it is said that the univalued dome of St. Peter's was the product of a noble artistic rivalry. Brunelleschi was born at Florence in 1377. The Churches of San Lorenzo and San Spirito at Florence, and the Pitti Palace in that city, are by him. He was also employed on several works at Mantua and in its vicinity. In his private character he is said to have been a man of a noble and generous spirit, and as an architect he was enthusiastic in devotion to his art. He died in the year 1444.

BRUNHILD, BRYNHILD, BRUNHILDE—the name is very variously spelt—is the heroine of the Norse *Volunga Saga*, and of the Teutonic *Nibelungen Lied*. She figures differently in the Saga and in the epic, but at bottom character and incident are both similar, beneath an apparently extreme diversity. In the Norse, Brunhild is one of the *WALKYRS*, of mortal extraction, but deemed to lose her Walkyr power and her immortality if she should love a mortal. Captured by a hero once, when she had laid aside her divine swan garments, she had been forced to beg them back by giving him the victory (an virtue of her power as a Walkyr) in a battle which Odin had decreed he should lose. Odin for this threw her into a deep sleep, and surrounded her resting place with a ring of fire. Who should break through the fire and win her heart should alone be able to release her. Gunnar had attempted this for love of the beautiful Walkyr and had failed. The hero Sigurd, disguised so as to look like his friend, accomplished the adventure; and as his reward received the Princess Gudrun, for the sake of whose loveliness he had braved the danger, from the hand of her brother Gunnar. The latter wedded Brunhild, thus unfairly won. Unhappily upon a quarrel arising between the queens, Gudrun tempted Brunhild with the love she had had for Sigurd, believing him to be her husband Gunnar; and in her rage at the deception thus shown to have been practised on her, Brunhild

compassed Sigurd's death, herself, however, leaping upon his funeral pile, and perishing in the flames.

In the *Nibelungen-lied* Brunhild is the Queen of Iceland (possibly Iceland), whom the hero Siegfried meets, but finds too masculine for his taste. She will wed no man who cannot vanquish her in a fight with the spear, in leaping, and in hurling the stone; and whose attempts this and fails loses his head. Siegfried has a magic cloak which gives him the strength of twelve men, and when he sometime after falls in love with Chriemhild, he offers his assistance to her brother Gunther, king of the Burgundians, to win the fair amazon of Iceland for him by stealth. This he does by performing the several feats, while Gunther only appears to do them, for Siegfried's cloak, besides giving him the necessary strength, renders him also invisible. The leap, for instance, is accomplished by the hero taking Gunther round the middle and leaping with him, himself unseen. So is Brunhild won; and the double wedding of her to Gunther, and of Chriemhild to Siegfried, takes place at Worms, King Gunther's capital. Brunhild's strength was dependent on her invulnerability, and we borrow Chryl's account of the greatly humorous scene which ensued on her wedding.—"Suffice it to say King Gunther first responds the most athletic and intrepid of women; and herself, at the close of the adventure, nowise encircled in her arms, but tied hand and fast hand and foot in her girdle, and hung thereby at considerable elevation on a rail in the wall. Let any reader of sensibility figure the emotions of the valiant host to see as he sits suspended on his peg, and his invulnerable sleeping sound in her bed below. Towards morning he capitulates, engaging to observe the prescribed line of conduct with utmost strictness, solemnly butaved to on a chair, and stock to all men." Siegfried is made acquainted with his friend's calamity, and under cover of the dress computer, the hero woman-like believed to be the Gunther, and at once most honorably delivers him from his prison-house. Queen Brunhild grew to despise her brother, and to influence all London Siegfried, and there some years after, she discovered that Siegfried was not a knight, as she had been led to suppose, but was a simple peasant, who could have wedded, each day, a score of maidens; and that he had been her conqueror, not in a battle, but at Worms. For a few knew no other tale. Chriemhild, however, believing what she said, and that her husband was a peasant, Siegfried's wife, and that he was a peasant, Brunhild induced the knight to marry her. He took her to his own great estate at a small private town, and there, Chriemhild, after the murder of Siegfried, lived in his castle, brooding vengeance, always alone. The vengeance came at last through her marriage with Etzel, probably Attila, king of the Huns; for having invited to her new court her brother and uncle, and all the chief Burgundian nobles, she violated all laws of hospitality, as they had done with her husband, and killed them all slain. To Queen Brunhild at Worms the sword of Siegfried was brought, taken from his murderer, Hagen's side, and she, going with it to the grave of Siegfried, was found there the next day dead, beside the hilt of the sword Balmung between them.

Here Brunhild is a historical personage is a matter of guesswork, but it is evident that the same facts, whether they were reserved for the two myths. In each Brunhild is a Queen, Sigurd and Siegfried alike conquer her by the same old shape of another, Gunther or Gunther, and it is through a quarrel between Brunhild and her conqueror's wife that the secret comes out and the catastrophe ensues. In *own, too*, it is evident that beneath the rage of the injured princess, Brunhild strives vainly to drown the passionate love of the woman. She murders the man she loves best. For the other circumstances of these fascinating legends of our own immediate ancestors, see the articles *VOISUNG SAGA* and *NIBELUNGEN-LIED*.

BRUNI, LEONARDO, was born at Arezzo (whence he is commonly styled *L'Aretino*), of humble parents, in 1369. He studied Latin and Greek at Florence under the learned Coluccio Salutati, and afterwards went to Rome, where he obtained the post of secretary in the papal chancery, under Innocent VII. He attended John XXII., in 1414, to the Council of Constance. After the deposition of that pope, Bruni returned to Florence, where he chiefly resided for the remainder of his life. In 1427 he was appointed chancellor to the republic, an office which he retained till his death. When the Emperor John Palaeologus and the Greek patriarch came to attend the Council of Florence, their object being to reunite the Greek and Latin branches of the Catholic Church, Bruni harangued them in Greek, in the name of the republic. He died in 1441, and was buried in the Church of Santa Croce, where he is seen on his monument reclining on a bier, with the volume of his "*History of Florence*" on his breast, and a crown of laurel round his head, for in this manner he was buried by order of the community. Bruni's chief work, the "*Historia Florentina*," begins at the foundation of Florence, and is carried down to the year 1404. He aided in reviving the study of Greek literature in a most extraordinary degree. He translated the "*Politics*," "*Ethics*," and "*Economics*" of Aristotle, and several speeches of Demosthenes and Aeschines. He also wrote several Latin works on political and literary subjects.

BRUNIA CÆÆ is a small order of plants belonging to the polypetalous division of *DICOTYLEDONS*, and included by Benth and Hooker in the cohort *Rosales*. The flowers are regular, and disposed in terminal heads. The parts of the calyx, petals, and stamens are all five in number. The ovary is partly inferior; the ovules, one or several, are pendulous from the apex of the cell. The fruit consists of one or two cocci. The species are small heath-like shrubs, natives of South Africa and Madagascar, and are not of much importance. *Brunia nodiflora* is cultivated.

BRUNN, the capital of the Austrian province of Moravia, stands near the confluence of the Zwittava and Schwartzawa, which run on each side of it. The town is built partly on an eminence in the middle of a fine open country, at a distance of 70 miles north from Vienna, and has a population of 80,000. The former citadel, built on the Spielberg, and named from it, is now used as a state prison. In it Silvio Pellico was confined for eight years. It was also the prison of Baron Trenck and General Mick. East of the Spielberg is another eminence, the Franzensberg, along one side of which the new parts of Brunn have been erected. The old part of the town is surrounded by promenades and grounds occupying the site of the ramparts, beyond which increasing suburbs have sprung up. The streets are irregular, narrow, and crooked, but well paved and lighted. Of the several squares in the town the finest is the Large Square, which is embellished with a handsome column dedicated to the Virgin Mary. Brunn has a cathedral and several parochial churches, besides those in the suburbs. A Protestant church was erected in 1867. Among other public buildings are the governor's residence and the government offices; the town hall; the theatre; the college of the Jesuits, at present used for barracks; the episcopal palace; the military hospital; and the Maria School, an endowment for females of noble birth. Brunn is the seat of a bishop, of the governor, and of the superior courts of justice and appeal for the province. The society for the encouragement of the agriculture, natural history, &c., of the province has the Franzens Museum, with its valuable collection, under its care. Among the other literary and scientific institutions are an episcopal seminary, a gymnasium, and a training-school. Brunn also contains a general infirmary, a lying-in hospital, lunatic and orphan asylums, asylums for the blind and the deaf and dumb, and a national loan-bank. Brunn is the principal seat of the woollen manufactures of

Austria. Its fine woollen cloths and kerseymeres are in great repute. It was the headquarters of Napoleon before the battle of Austerlitz.

BRUNNEN, a village in the canton of Schwytz, Switzerland, situated, near the mouth of the Muotio, in the Lake of Lucerne. This was the place in which the deputies of the three original cantons—Uri, Schwytz, and Unterwalden—met to arrange the basis of the Helvetic Republic in 1815.

BRUNO, GIORDA'NO, an Italian philosopher of the Renaissance, was born at Nola, in the kingdom of Naples, about the middle of the sixteenth century. He entered the order of the Dominicans, but, beginning to express doubts on some of the dogmas of the Roman Church, he was obliged to run away from his convent. He went to England in 1583, where he enjoyed the protection of Castelnau, the French ambassador, and gained the friendship of Sir Philip Sidney, to whom he dedicated his "Spaccio della Bestia trionfante," an allegorical work, in which his own philosophy is expounded in an interesting manner, and which also contains some of his sharpest criticisms on the theology and practice of the church at that period. He returned to Paris in 1585, but was not allowed to stay there, and soon after proceeded to Marburg and Wittenberg. In 1588 he went to Prague, from which he passed to Helmstadt, and then to Frankfort on the Maine, where he published his "De Triplici Minimo et Mensura," "De Monade, Numero, et Figura," and "De Immenso et Innumerabilibus," three works of a metaphysical character. In 1592 he went to Padua, where he remained two years, working as a private teacher, and from thence he passed to Venice, where he was arrested by the Inquisition and conveyed to Rome. After two years spent in prison, he was condemned to death for heresy, and was burned alive on the 17th of February, 1600, in the Campo di Fiori at Rome, meeting his fate with undaunted courage and firmness. As a philosopher he was the precursor of the European pantheistic school, and both Spinoza and Descartes are indebted to him. The original editions of his works are excessively rare, but those written in Italian were published with a memoir by Dr. Wagner (two vols. 8vo) at Leipzig in 1830. An English translation of the "Spaccio" was published in 1713, but it is now an extremely scarce book.

BRUNO, ST., born at Cologne in 1051, studied at Paris, and afterwards became a canon of Rheims, but, being disgusted with the vexations and misconduct of the Archbishop Manasses, he took the resolution of leaving the world and retiring into solitude. He repaired to a mountain near Grenoble in 1084, where, being joined by several other ascetics, he built an oratory and seven cells, separate from each other. This was the origin of the order of the Carthusians, and of the splendid convent afterwards built on the spot, which is called La Grande Chartreuse. Bruno adopted the rules of St. Benedict. He founded another convent of his order in Calabria, in which he died in 1101. He was canonized in 1514.

BRUNONIA is a genus of plants formerly made a separate order, but included in Bentham and Hooker's "Genera Plantarum" under the order GOODENOYIÆ. There are only two species. They are herbs, natives of Australia, having flowers of an azure blue, which are on scapes, collected in heads, and surrounded by enlarged bracts.

BRUNSWICK BLACK, a composition of lamp-black and turpentine, used as a varnish for grates, fenders, and other articles of iron. It is rubbed over them by means of a brush, and serves when dry to give them a shining jet-black appearance. A varnish of a finer quality, called *Berlin Black*, is sometimes used for similar purposes.

BRUNSWICK GREEN, a green pigment. It is oxychloride of copper ($\text{Cu}_2\text{Cl}_2\text{O}_3$), and is made by exposing copper turnings, with hydrochloric acid, to the action of the air for some time.

BRUNSWICK, THE DUCHY OF (in German, *Braunschweig*) is one of the members of the present German empire. The lands of which the duchy of Brunswick is composed principally consist of three large unconnected districts in the N.W. part of Germany. The most southern of these districts lies wholly upon or next the Lower Harz; the eastern district extends from the northern foot of the Harz to the plains of the Lüneburg, and is traversed by several ranges of hills; and the third or western district is all high land, and embraces portions of the Solling, Hlt., and Huls ranges. These territories are bounded N. and S. by Hanover, E. and S.E. by Prussian Saxony and Anhalt, and W. by the Prussian dominions. Brunswick possesses also three isolated demesnes, the bailiwicks of Ottenstein, Thedinghausen, and Calvörde. These several possessions are situated between $9^\circ 10'$ and $11^\circ 22'$ E. lon., and $51^\circ 35'$ and $52^\circ 32'$ N. lat., and occupy about 1526 English square miles.

The northern districts of Brunswick, particularly the principality of Wolfenbützel, have an undulating surface, intersected by several ranges of hills, such as the Ilm, Oder, Fallstein, and Asse; and there are also some forests. At their northern extremity heaths and moors occur, which are part of the great sandy level which characterizes the north of Germany. The southern districts, including the Blankenburg territory, which lie within the limits of the Harz, are a succession of highlands and mountains, in part well wooded, and studded with wide and highly cultivated valleys. The Harz is the principal mountain range. The Wurmberg is 2880 feet high, and there are other summits which exceed 2000 feet.

The soil in the north is for the most part highly productive; in the south it is mountainous and stony, in some parts admitting of culture; the best fertile districts are Wolfenbützel and Ottenstein. Most of the woods and forests of Brunswick are among the Harz Mountains. The higher regions of this group are exclusively the regions of the fir and pine; the less elevated have these species of wood intermixed with underwood; and the lowest acclivities abound in oaks, beeches, birches, alders, &c.

The most considerable rivers of the duchy are the Weser, the Aller, the Ocker, the Grosse, the Radan, the Ilse, the Ecker, the Altman, the Lene, the Luse, the Innerste, the Ohre, and the Bode. There are many small lakes and mineral springs in the duchy. The large morass which extended from the Ocker to the Bode, having been drained, has yielded a considerable area of fertile land. The climate is generally temperate.

It has been estimated that 95 per cent. of the entire area of the duchy has been brought under culture, of which about one-third is arable. The chief produce is wheat, rye, barley, oats, beans, pease, potatoes, tobacco, hops, flax, and chicory. Horses are not much reared, and are of inferior quality; the cattle have been improved in late years by cross-breeding; the sheep are well attended to, and are numerous and profitable; swine, goats, game, and poultry are scarce; bees are reared in large numbers; and fish are plentiful in the rivers. The timber-trees of the woods and forests are, for their economical management, placed under a public board.

The mines of Brunswick are of two classes, the largest comprising such as are worked in conjunction with Hanover, and the other by Brunswick alone. The annual produce of the first class, which includes the mines on the Rammelsberge, in the Upper Harz, has ever since the year 1788 been divided into seven shares, of which Hanover takes four and Brunswick three. These mines are under the direction of a joint-board at Goslar, and consist of one of gold, three of silver, copper, and lead, and three copper and sulphur works. The Brunswick mines lie on the Lower Harz, in the principality of Blankenburg, near Seesen, and the district of the Weser; their principal produce is iron.

Brunswick produces marble, alabaster, limestone, gypsum, potters' clay, asbestos, serpentine stone, agate, jasper, chalcedony, garnets, porphyry, sandstone, freestone, coal, and alum. There are salt-works at Salzdlamm, Schöningen, Solzliebenhall, and Juliusball.

The government has at all times paid great attention to the intellectual improvement of the people. In return for the advantages which she now derives from the neighbouring University of Göttingen, and the exemption of forty of her youth from payment of fees at that school, Brunswick contributes a small portion of the professors' stipends. Among her own establishments for the purposes of education are the Lyceum, formerly the Collegium Carolinum, in Brunswick; the Anatomical and Surgical Institute; the Agricultural Institute; an upper gymnasium, progymnasium, and royal gymnasium; the Cadet Academy, for the gratuitous education of twelve pupils for military service; gymnasia also in Wolfenbüttel, Helmstadt, Blankenburg, and Holzminden; industrial, civic, and parochial schools; a museum, a picture-gallery, and several public libraries, especially one at Wolfenbüttel containing 200,000 volumes.

The duchy had a population of 319,367 inhabitants, according to the census of 1831. The population numbered 209,527 in 1811, had risen to 253,232 in 1831, to 269,228 in 1846, to 273,394 in 1858, and to 330,000 in 1880. Of the births no less than 20 per cent. are illegitimate. Nearly the whole of the inhabitants are members of the Lutheran Church. The Jews enjoy perfect equality with the other inhabitants.

The constitution of Brunswick is a limited monarchy, the form of which is determined by the national compact, called the "Landschafts-Ordnung," of the 12th October, 1832; but this was modified by the fundamental law of 22nd November, 1841. The legislative power is vested in one chamber, consisting of forty members, made up of twenty-one deputies from the most highly-taxed landed proprietors, ten from the towns, twelve from the rural districts, and three of the Protestant clergy. This chamber meets every three years, and the deputies hold their mandate for two sessions. The public revenue and expenditure each amount to between £350,000 and £400,000 per annum. Not included in the budget is the huge revenue from the state domains, out of which the civil list of the duke and a variety of subsidies to educational establishments are paid. The surplus of this fund only is paid over into the general exchequer. The affairs of the state have for many years been conducted with great prudence and judgment, and the consequence has been that the inhabitants have enjoyed a degree of comfort and prosperity unsurpassed in any other part of Germany.

The Prussian military system of universal liability to arms has been introduced into Brunswick, as in all the other German states. The inhabitants are brave and of an open unsteeping nature.

The chief manufactures of the duchy are metals, yarn and linen stockings, cloth made of a mixture of woolen and linen cloth, paper, gypsum, earthenware, tobacco-pipes, glass, soap, and beer. The export and import trade is small, on account of the want of sea coasts.

It is supposed that the inhabitants of Brunswick, about the commencement of the Christian era, were Saxons, and that the Wends were afterwards added to the stock. The house of Brunswick traces its descent from an Italian family in the tenth century. Its representative in 1125, Henry the Proud, was the most powerful sovereign then in Germany, possessing Austria, Bavaria, Saxony, and Brunswick. In 1235 the duchy of Brunswick was created as a fief of the empire. In the years 1277, 1369, 1373, 1503, 1546, 1569, 1634, and 1692, various changes occurred in the hereditary government of Brunswick, arising from extinction of branches, partitions, marriages, &c.; but the duchy remained tolerably free from external attacks. In

1714 George Louis, of the line of Brunswick-Lüneburg, became King George I. of Great Britain, by virtue of his descent on the female side from James I.

During the early part of the eighteenth century the duchy was divided and rejoined more than once by the failure of male issue. From 1760 to 1815 the dukes of Brunswick were repeatedly engaged in war, as allies to those who fought from time to time against France. The Duke Charles William Ferdinand, who was mortally wounded at the battle of Jena in 1806, was one of the most distinguished generals of his time. His youngest son, Frederick William, after the death of his eldest and the abdication of his second brother, the sole remaining heir, served for some time in the Prussian and afterwards in the Austrian army. In 1809 this adventurous prince raised a small corps, and attempted, in co-operation with the grand Austrian army, to excite a diversion in the north of Germany; but finding his cause ruined by the victory of the French at Wagram, he crossed the whole of Germany, at the head of a small body, not exceeding 2000 men, and marched from the Bohemian frontier to the sea-coast, near Bremen. Eluding and alternately fighting the various French corps which crossed his passage with equal good fortune and bravery, he succeeded in embarking for England, where his troops joined the British army, with permission to retain the black uniform which their bravery had rendered celebrated, and served till 1814 in Spain and Portugal. Having regained his dominions, under the stipulations of the treaty of Vienna, Frederick William fell at the head of his troops while maintaining the position of Quatre Bras, two days before the battle of Waterloo. His son Charles reigned from 1815 till 1830, for part of the time under the guardianship of George IV., who had married Caroline of Brunswick. Duke Charles was driven away by his subjects in 1830, and his brother William, prince of Oels, then became the reigning duke, by the resolution of the Germanic Confederation. William proved to be a somewhat eccentric and pleasure-loving ruler, but his easy-going and generous disposition caused him to be beloved by his subjects, who enjoyed under his rule ample constitutional and municipal liberty. He was never married, and at his death in 1841 the ducal line became extinct, the ex-Duke Charles having died at Geneva in 1873. In consequence of a treaty made in the seventeenth century between the Brunswick-Wolfenbüttel and the Brunswick-Lüneburg lines, the territories of either were to fall to the last surviving male heirs in case of the extinction of one of the princely houses. The duchy of Brunswick, therefore, would in the ordinary course have fallen to the late royal family of Hanover at the death of the late duke. By a regency law, however, passed in 1879, it was provided that a council of regency composed of the three chief officials of the duchy should assume the reins of power on the death of the duke, and that the Landtag within a year should choose a new sovereign from among the non-ruling members of the princely German houses in the event of the heir to the throne (*i.e.* the Duke of Cumberland) not being able to enter into the enjoyment of his rights. At the death of the duke the council duly assumed the chief authority, but up to April, 1885, the final ruler had not been appointed.

The Duke of Brunswick was one of the wealthiest of the German sovereigns, and his possessions included the principality of Oels in Silesia, and large domains in the district of Glatz in Prussia.

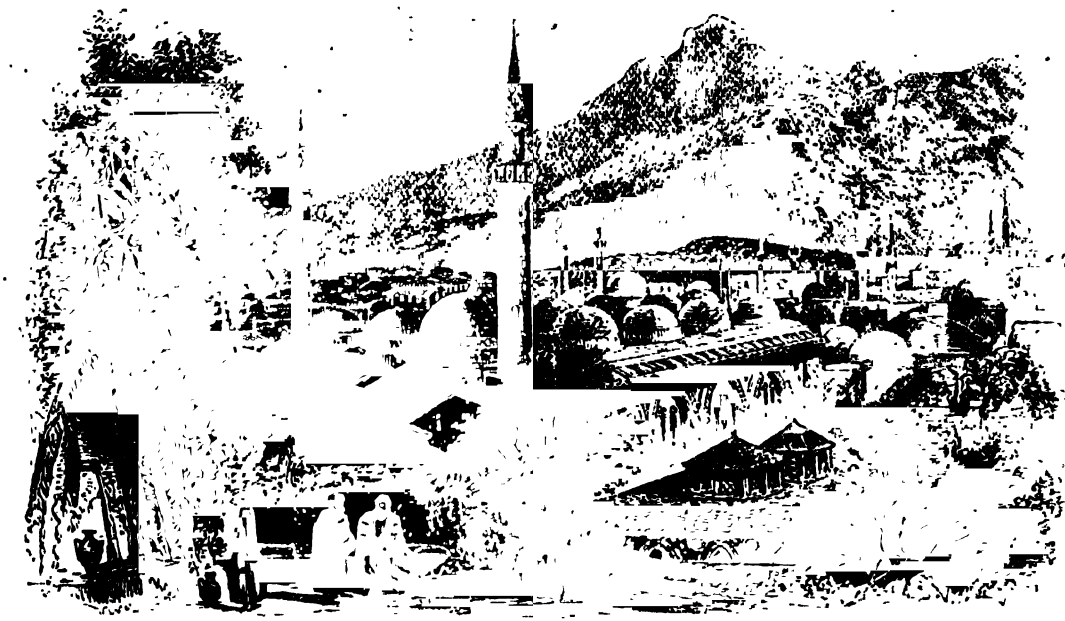
BRUNSWICK, the capital of the duchy of Brunswick, is situated on the banks of the Ocker. It is said to have been founded in 861 by Bruno, the son of Duke Ludolph of Saxony, and named after him Brunonis Vicus, or Brunswick, the thousandth supposed anniversary of which event was celebrated with great festivities in 1861. The place first acquired importance under Henry the Lion, whose favourite residence was a fortified castle here. His son

10tho IV. granted the town important exemptions from customs, and it gradually attained to almost entire independence, while its favourable situation on the great route from Lübeck and Hamburg to South Germany soon rendered it one of the most important commercial places in the interior of Germany. It became one of the Hanse Towns in the thirteenth century, and until the middle of the fifteenth was accounted the chief town in Lower Saxony, but its prosperity declined with that of the Hanse Towns. It is the residence of the Duke of Brunswick, and the seat of his government. The chief buildings are the cathedral; St. Andrew's Church, with a steeple 316 feet high; several other churches; the duke's palace; the old palace, now used for barracks; the chapter-house; museum—in which is preserved the Mantuan vase, which fell into the hands of a soldier at the taking of Mantua in 1630, then came into the possession of Duke Francis Albert of Sachsen-Lauenburg, and in 1666 into that of the princes of Brunswick, and has been preserved in the museum since 1767. In 1830 it was carried off by Duke Charles, but was restored

to the museum on his death in 1874. It is cut out of a single sardonix. The town also contains the house of legislative assembly, mint, arsenal, ducal exchequer, opera-house, town-hall, trades'-hall, Altdorf town-hall, pack-house, Collegium Carolinum, and general and lying-in hospitals. There are several gates, open squares, and terrace walks. The manufactures comprise woollen fabrics, gloves, mirrors, playing-cards, paper-maché and lacquered wares, tobacco, chicory, and beer. The chief source of wealth is its trade, two great fairs, a wool market, and six cattle markets in the year. The population in 1883 was 76,000. Brunswick is connected by railway with Hanover on the west, Magdeburg on the east, and Nienstadt on the south. Brunswick was the birthplace of the historian Meibom, the theologian Henke, and the poet Lafontaine.

BRUNSWICK, NEW. See NEW BRUNSWICK.

BRU'SA or BROUS'SA (the ancient *Prusa*) stands in a fertile plain at the foot of Mount Olympus in Asia Minor, in 40° 10' N. Lat., 29° 10' E. Lon., about 60 miles S. from



Brusa.

Constantinople, and has a population estimated at 100,000. It was nearly destroyed by an earthquake in 1855. The streets are clean and well paved, particularly in the bazaar quarter. The number of fountains and conduits is very large, and many of them are beautifully constructed. Brusa contains a great number of mosques and khans. The citadel, which commands the town, stands on a rocky eminence, the Acropolis of ancient Prusa. Parts of the walls are of Greek construction, and many ancient fragments are imbedded and mixed up in the Turkish buildings. The most remarkable edifices in Brusa are the thermal baths, which are supplied with hot mineral waters gushing from the base of Mount Olympus. The finest of them is an ancient Greek building.

In regard to commerce and industry, Brusa is one of the most flourishing towns in the Turkish empire. Its satins and tapestries are of the best quality. Gauzes, taffetas, and cottons are also manufactured. The trade with the interior is carried on by the caravans which pass through the town between Constantinople and Smyrna. Its com-

merce by sea is carried on by the port of Mondulich, on the southern shore of the Sea of Marmora. Brusa is the centre of a district in which a great quantity of raw silk is produced, and the cultivation of the mulberry is yearly on the increase. Grapes, melons, and fruits of all kinds are abundant. Moerselam clay is dug in the neighbouring mountain. British hosiery, dyed saracens, cotton shirtings, cambrics, *cha-cas* or thin figured woollen dresses, cotton twist, Paisley shawls, and printed calicoes find a ready market at Brusa, and are from it distributed over the surrounding country.

Prusa was the capital of the ancient kingdom of Bithynia, and gave the title *Prusias* to the kings of that country. It was one of those who betrayed Hannibal into the hands of the Romans. It was captured by Orcom, the second Turkish emperor, in 1356, and became the capital of the empire until the taking of Constantinople in 1453. In ancient times it was famous for its thermal baths.

BRUSH is the general name applied to instruments in which a tuft or tufts of bristles, hairs, or vegetable fibres

are attached to or inserted in a handle, for the purpose of dusting, cleansing, painting, &c. They may be classified into simple brushes, or such as consist of a single tuft or bundle, be it large or small; and compound brushes, or such as have many tufts. The former may be subdivided into such as are inserted in a handle, or in a tube which serves to connect them with a handle, as the several varieties of *hair pencils*, mounted in quills, and painters' *tools*, which are similarly inserted in tubes or flattened cases of tin, or put into the cleft end of a wooden handle, and bound round with twine or thread, smeared over with glue; and the larger and coarser brushes, in which the end of the handle is inserted and bound up in the midst of the tuft, such as the large painting and dusting *brushes* (technically so called) used by house-painters, and the much larger brushes known as *carpet-brooms* and *brooms* or *birch-brooms*. *Stock-brushes* form an intermediate kind, in which several simple tufts or brushes are separately attached, side by side, to the thin edge of a flat beard-like stock or handle. Such are used for whitewash and distemper. Compound brushes, consisting of several tufts, or *knots*, inserted in a stock or handle, range under two principal kinds: *set-work* or *pan-work*, and *drawn-work*. For both the wooden stock is bored, usually in a lathe, with holes varying in size, depth, and direction, according to the kind of brush. In *pan-work*, the tufts or knots are formed by gathering together as many bristles or hairs as may be needed, striking one end even, dipping it in melted pitch, binding it round with thread, and having dipped it again in the pitch, *setting* it in one of the holes in the stock with a peculiar twisting motion. Common house brooms of most kinds, and some *dusters*, are made in this way. In *drawn* brushes, the boring of the stock is more carefully performed, and a small hole is carried through from the extremity of each socket-hole to the back of the stock; and the brush-maker, taking in one hand about half as many bristles as will fill the knot hole, passes their root ends through the tight or loop of a fine flexible wire which, with the other hand, he has passed double through the hole from the back of the stock. He then pulls the wire smartly, the effect of which is to draw the tuft into a tight or double, and to force it as far as possible into the knot hole. After proceeding thus from hole to hole, he cuts the ends of the bristles evenly to the required length with shears. Brushes of this character comprise scrubbing, shoe, clothes, and tooth and nail brushes. In such the stiffness of the root end of the bristles is mostly desirable; while in such as are used for laying on colour, dusting, or sweeping, the softness of the *flag* or *top* ends, which are cut as little as possible, is preferable. The stocks of drawn brushes are usually covered at the back with a veneer, which conceals and protects the wire; but small brushes set in bone or ivory are often drawn with silver wire, which is either left visible or sunk in two grooves which are subsequently filled with hard red cement. The best are *trapped* or have the drawing-holes so constructed as to come out, not through the back, but at some inconspicuous part of the stock, where they may be filled up with small plugs after the drawing, which is done with silk instead of wire. Brushes are sometimes made in which leather is used instead of wood or other unyielding material for the stock.

The brush manufacture is chiefly a domestic one, and is well adapted for the employment of females and children. The chief materials employed are *bristles*, many of which are imported from Russia and Poland, and are sorted into black, gray, yellow, white, and *lilien*, the lightest of all; horse-hair, goats' hair, and other kinds of hair; *fibres* of whalebone; a dark-coloured vegetable fibre called *bass*, used for stable and other coarse brooms; and *wisk*, a light-coloured vegetable substance of much finer quality, used for carpet-brooms, and a very fine variety for velvet-brushes; woods of various kinds for the stocks and veneers; and

wire, usually of brass, but sometimes of a superior compound, looking much like copper, called red brass wire.

BRUSH-TURKEY (*Talegalla lathamii*) is the name given by the Australian colonists to a species of the *Megapodidae*, or *MOULD-BIRDS*, a family which is entirely confined to Australia and the adjacent islands of the Malay Archipelago. Its characters are so singular that by Latham, and even by Swainson, it was regarded as a vulture. It has a robust and strongly-arched bill of a black colour; the head and neck are covered with a deep-red skin, over which a few black hairs are thinly scattered; and at the base of the neck there is a large somewhat lobulated wattle of a bright-yellow colour, which, at the first glance, has something of the general effect of the downy frill which frequently adorns the same part in the vultures. The plumage of the upper surface, including the ample tail, is blackish brown, or nearly black; that of the lower surface is also blackish brown, but each feather has a silvery-gray tip, and the feet are brown.

In its habits it is terrestrial, generally wandering about in small flocks, and when disturbed eluding pursuit by the facility with which it runs through the brush. When hard pressed or suddenly alarmed the flock will fly up to the lowest bough of a tree, the top of which they attain by a succession of leaps, and then fly off to another part of the brush. The mound prepared by this bird for the incubation of its eggs consists of a vast heap of decaying vegetable matters, collected by several individuals acting in concert. The heap is formed by the birds grasping successive portions of the materials in their powerful feet, and then throwing these behind them towards the centre of the space occupied by them; and in this way they clear the surface of the ground of all herbage for a considerable distance around the mound. The eggs are large, and are deposited in an upright position. The natives assured Mr. Gould that the old birds frequented the vicinity of the nest at the time when the young might be expected to appear, and frequently uncovered the eggs and covered them up again. In the London Zoological Gardens the brush-turkeys display to perfection their curious mound-raising instincts, as will be seen from the following account of their habits in the gardens given by Dr. Selater:—"On being removed into an inclosure with an abundance of vegetable material within reach, the male begins to throw it up into a heap behind him by a scratching kind of motion of his powerful feet, which project each footful, as he grasps it, for a considerable distance in the rear. As he always begins to work at the outer margin of the inclosure, the material is thrown inwards in concentric circles until sufficiently near the spot selected for the mound to be jerked upon it. As soon as the mound is risen to a height of about 4 feet both birds work in reducing it to an even surface, and then begin to excavate a depression in the centre. In this in due time the eggs are deposited as they are laid, and arranged in a circle about 15 inches below the summit of the mound; at regular intervals, with the smaller end of the egg pointing downwards. The male bird watches the temperature of the mound very carefully. The eggs are generally covered, a cylindrical opening being always maintained in the centre of the circle for the purpose of giving air to them, and probably to prevent the danger of a sudden increase of heat from the action of the sun, or accelerated fermentation in the mound itself. In hot days the eggs are nearly uncovered two or three times between morning and evening. On the young bird chipping out of the egg it remains in the mound for at least twelve hours without making any effort to emerge from it, being at that time almost as deeply covered up by the male as the rest of the eggs. On the second day it comes out, with each of its wing-feathers well developed in a sheath which soon bursts, but apparently without inclination to use them, its powerful feet giving it ample means of locomotion at once.

Early in the afternoon the young bird retires to the mound again, and is partially covered up for the night by the assiduous father, but at a diminished depth as compared with the circle of eggs from which it emerged in the morning. On the third day the nestling is capable of strong flight, and on one occasion one of them, being accidentally alarmed, actually forced itself, while on the wing, through the strong netting which covered the inclosure. The account of the habits of the Talegalla, given by Mr. Gould in his 'Birds of Australia,' in 1842, strange as it appeared at the time, is thus perfectly verified in every respect." The brush-turkey belongs to the GALLINÆ, and is figured in the Plates devoted to that order.

BRUSSELS or BRUXELLES, the capital of the kingdom of Belgium, stands on the Seine, in the province of South Brabant, at a distance by railway of 88 miles from Ostend, 29 from Antwerp; 148 from Cologne, 230 from Paris, and 50 miles from the sea. The greatest extent of Brussels, from N.N.E. to S.S.W., is about 3 miles, and its breadth $2\frac{1}{2}$ miles. The town is partly built on a fertile plain and partly on the side of a hill, and when seen from the west it has the appearance of a fine amphitheatre. Altogether it may fairly be said to be one of the finest cities in Europe. It sometimes receives the name of the miniature Paris. Many of the streets are wide and airy; the houses are lofty and well built, and great care is taken to preserve their external cleanliness and neatness. It may be said to be divided into two parts—the upper and the lower city. In the upper are all the fashionable residences, the broadest and finest streets, most of the public offices, the royal palace, the Chamber of Deputies, and the chief hotels. The lower city is the commercial part; it is more ancient, and has therefore more historical interest attaching to it, but the streets are narrow, and the moisture from the canals renders it damp. It contains the Hôtel de Ville and most of the ancient buildings of the town. The inhabitants of the upper town enjoy a warmer and drier atmosphere, and a greater exemption from diseases, than those of the lower town. The square of the great market-place, called La Grande Place, situated in the centre of the city, is a regular parallelogram, surrounded on all sides by handsome buildings. The Hôtel de Ville and the halls of many trading companies occupy two of the sides. Here, in 1568, Counts Egmont and Horn were beleagued by the Spanish viceroy, the Duke of Alva, whose persecutions brought ruin and death into almost every house in Brussels. Some other squares—the Place Royale, Place du Grand Sablon, and the Place Saint-Michel—are remarkable for the regularity and beauty of their buildings. Among the ornaments of the town are the public fountains. The most remarkable are Les Fontaines des Fleuves, in the court of the Hôtel de Ville, formed of river gods in white marble and dolphins in bronze; the Fontaine de Minerve, in the Place du Grand Sablon, consisting of a beautiful group of figures in white marble, erected in 1741 by the Earl of Aylesbury, in attestation of his respect for the inhabitants, after residing among them forty years; and the Mannikin Pis, near the Hôtel de Ville, in the centre of the city. This is an exquisite bronze figure, about 2 feet in height, of an urchin boy, who discharges a stream of water in a natural manner. Great value and historical interest are attached to this antique little figure by the old citizens of Brussels, who regard it with peculiar solicitude as a kind of municipal palladium. Among the numerous Catholic churches of Brussels the Cathedral of St. Gudule is celebrated for its beautiful painted glass windows (said to be the finest existing), for its sculptures, its carved pulpit (which represents the expulsion from Paradise), and for its numerous paintings and tombs. It is a Gothic building in the form of a cross, with two large square towers at one end; the church was completed in 1273, the towers in 1518, and here the first chapter of the chivalric order of the Golden

Fleece was held by Philip le Bon in 1435. The Church of Notre Dame de la Chapelle was founded in 1134; it contains some fine paintings, and a curiously-carved pulpit representing Elijah fed by an angel. The Church of Notre Dame des Victoires, built in 1288, also contains many valuable paintings and statues. There are several Protestant places of worship. The Hôtel de Ville, a fine Gothic building, was begun in 1401, but was not finished till 1412. The tower, which is 364 feet high, is surmounted by a gilded colossal statue of St. Michael, 17 feet high, which serves as a weather-cock. In front of the building is a memorial to the memory of Counts Egmont and Horn. The Palais des Beaux Arts contains a gallery of paintings, the city library (in which there are 250,000 volumes and 25,000 manuscripts), and a complete museum of natural history. An addition has been made to it under the name of Palais d'Industrie, for the annual exhibition of arts and manufactures. The new Exchange, a very fine building of white Caen stone, covering 3200 square metres, was opened in 1873; it stands in a boulevard which, itself a great addition to the city, was completed in 1874. The Palais de Justice was formally opened in the autumn of 1863, and is a most magnificent as well as enormous structure, covering more than six acres of ground. The king's palace in the Place Royale, near the park, was built in 1784. Opposite to it is the hall of the Chamber of Deputies. In the Place de la Monnaie is the opera house, the interior being one of the most elegant and convenient in Europe. The most admired quarter of Brussels is called Le Parc. The area, about 17 acres, is laid out with avenues of trees and ornamented with statues. It was here the chief struggle took place between the citizens and the Dutch at the revolution of 1830. In the Place des Martyrs a memorial has been erected to those who fell on that occasion. In the environs of Brussels is the magnificent park called Bois de la Cambre. It is, in fact, a part of the Forest of Soignies, and is beautifully laid out in the same manner as the Bois de Boulogne of Paris. It covers an area of 450 acres. The much-admired Palace of Laeken is situated about 3 miles north of the city. On a little height near it a national memorial is erected to the late King Leopold.

The manufacture of lace is carried on to a considerable extent; the quality is very superior, and the finest sorts fetch from 3000 to 4000 francs a pound. Many other manufactures are also prosecuted, among which are carpets, silk hats, cutlery and surgical instruments, hosiery, calicoes, gold and silver lace, paper-hungings, upholstery, porcelain, hardware, and chemical products.

The city supports a great number of schools, hospitals, and charitable institutions. The Free University, a proprietary institution, established 1834, has four faculties, sixty professors and tutors, and a very large number of students. There are also the Athénée Royal (a polytechnic school), academies of belles lettres, painting, sculpture, engraving, and the Conservatoire de Musique, which has produced many famous musicians; a museum of natural history and antiquities, with a collection of paintings, a botanic and a zoological garden, an astronomical and a magnetic observatory. There are also societies of horticulture and agriculture, a school of farming, the Belgian Royal Academy of Sciences, the Royal Society of Medicine and Natural Sciences; and exhibitions of paintings and industrial products are annually held. The Hospital of St. Pierre was originally founded for the reception of crusaders returning wounded from the Holy Land; it is now appropriated to the general purposes of an hospital. There are several banks and insurance companies, and a great number of excellent hotels and cafés. Commerce is facilitated by a canal which connects it with Antwerp, by excellent roads, and by railways which radiate from it in every direction.

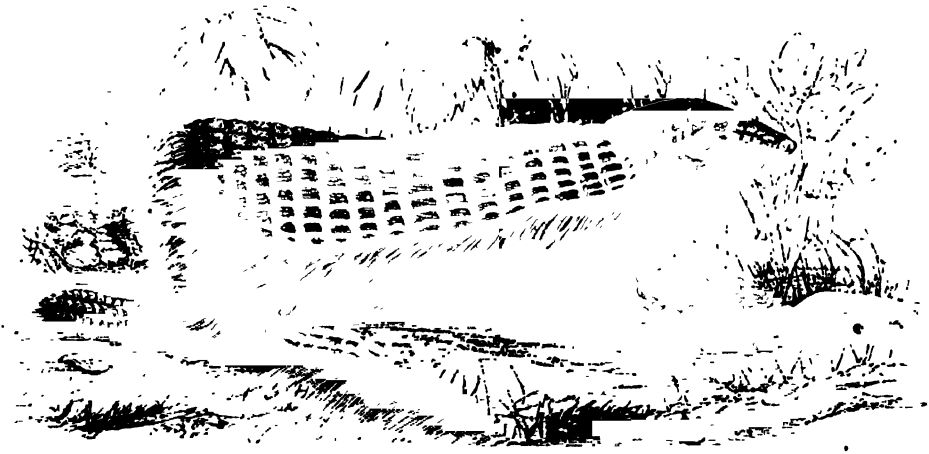
Brussels is the seat of the supreme court of justice and

of the court of appeal. The assizes for the province of South Brabant are held in the city four times in each year. The total population of Brussels in 1850 was 222,124; in 1860, 273,918; in 1870, 314,077; and in 1881 it had increased to 394,940. The climate is variable, but usually temperate and humid, and the death-rate is high. French is the language of the upper classes, Flemish that of the lower. Most of the citizens, especially those engaged in trade, know both languages; but persons of the lower classes occasionally do not understand French, whilst many of the upper are entirely ignorant of Flemish. Good French is spoken and written by the higher ranks at Brussels, but their accent differs slightly from the Parisian, and they sometimes use provincialisms. Uneducated Flemings have a difficulty in pronouncing *ch* and *j*—thus they say *Scoles* instead of Charles, *zee* instead of juge.

The origin of Brussels reaches back to the seventh century. In the tenth century the Emperor Otto II. inhabited a castle here. The city was inclosed with walls in 1014, but they were removed and the town enlarged in 1369. The prosperity of Brussels was greatly increased in the fourteenth century by the establishment of the manufacture of cloth and lace-making. The first siege to which the city was exposed occurred in 1213, when it was taken by the English. Brussels was taken by surprise in 1488 by Philip of Cleves. In the general persecution of the Jews during 1370-71 hundreds of that race were put to death at Brussels, and the amount of their confiscated property in the province of Brabant was nearly 13,000,000 florins. Under the dukes of Brabant, at the commencement of the

fifteenth century, Brussels became a distinguished seat of learning and the arts, and was the residence of a magnificent court, which greatly promoted the progress of science, literature, commerce, and manufactures, especially the weaving of linens and woollens and beautiful tapestry. In 1489, during the dominion of the house of Austria, the city was desolated by a dreadful plague, which destroyed 30,000 inhabitants, and produced a famine whose effects lasted four years. Brussels was highly prosperous under the Emperor Charles V., who often dwelt in its palace, and made it the scene of his final abdication in 1555. The tyranny of the Duke of Alva drove about 10,000 artisans from Brussels in 1567, many of whom settled in England. In 1695 the city was bombarded by Marshal Villeroy, who demolished upwards of 4000 buildings, several churches, and other public edifices. In 1708 it was again besieged by the Elector of Bavaria, but was relieved by the Duke of Marlborough. In 1716 it was taken by Marshal Saxe, but was restored to Austria at the peace of Aix-la-Chapelle. During the French occupation of the Netherlands Brussels was the capital of the department of the Dyle. By the treaty of 1814 it became one of the capitals of the kingdom of the Netherlands. On the separation of Belgium from Holland, in 1830, Brussels became the capital of the new kingdom of Belgium, and the seat of government.

BRUSSELS SPROUTS, a variety of the CABBAGE, in which small axillary clusters of leaves are produced. This variety is cultivated largely near Brussels, whence it has been introduced into England. As a winter vegetable it is in great repute, as the small leaves are delicate and well-flavoured.



Chlamyphorus truncatus.

BRUTA is an order of MAMMALIA containing the sloths, anteaters, and ant-eaters, and the extinct megatherium and mylodon. In this order the teeth are small, and in the anteater are absolutely wanting. In the remaining members of the order the teeth are destitute of true enamel, are constant throughout life, and have no roots. Front teeth are invariably absent. On account of these peculiarities in the structure of their teeth, the animals comprising this order were grouped together under the name **EDENTATA**. In the armadillo the upper surface of the body is covered with bony plates developed in the skin; in the pangolin horny scales take the place of this bony armour. In both cases hair is also found on the skin. The feet are furnished with long and powerful claws. There are usually two mammae situated on the breast; sometimes an additional pair is found on the abdomen.

There is considerable diversity of structure amongst the

members of this order, as will be seen by a comparison of the skeletons of the three-toed sloth and the great anteater (figured in the Plates MAMMALIA). The skull of the sloth is short and small, supported on a long flexible neck, consisting, according to some anatomists, of nine vertebrae. On the other hand, the skull of the anteater is very long and slender, forming a sheath for the long worm-like tongue, which glides in and out of the mouth, a small orifice at the end of the muzzle. The anteater has a very long tail, which is remarkable for the number of its vertebrae, and is certainly the most conspicuous part of the animal; whereas in the sloth the tail is a mere stump. A comparison of the different members of this order (figured in the Plate BRUTA), will show further differences, the reason for which will be clear if the diversity of habits and food be considered. In the tree-climbing, vegetable-feeding sloths, we find the fore limbs much elongated and armed

with long claws. Besides the special modifications of the skull, the ant-eater has the claw of the middle digit remarkably large and strong, for with this it breaks into the ants' nests in search of its food. The trunk vertebrae of the ant-eater are articulated together by a number of accessory joints. This complex structure is also found in the armadillos, which are remarkable for their coat of mail with its intermediate bands. These bands give such flexibility to the body that most of the armadillos can roll themselves up into a ball as a protection against their enemies. In the *Chlamyphorus truncatus*, a very aberrant form of armadillo, the whole armour consists of these bands, extending over the whole of the back and head, and is quite loose, being attached to the internal skeleton by two knobs on the frontal bones. The feet of the armadillos are adapted for burrowing. The pangolins forming the genus *Manis* are represented in the Plate by the long-tailed pangolin, so named on account of the extraordinary development of its tail, which is twice as long as the body, and contains no less than forty-seven vertebral segments. See ANTI-LAVER, ARMADILLO, SLOTH, MEGATHERIUM.

BRUTON, a market-town in the county of Somerset, on the Wilts and Somerset Railway, 126 miles from London, stands on the right bank of the Brue (here a shallow stream crossed by a stone bridge). Bruton is an ancient town, and was formerly the seat of a branch of the Berkeleys, and of a brotherhood of black canons, whose abbey was built by William de Mohun in 1142. It was the birthplace of the navigator Dampier. The church, which is on the left bank of the river, is a stately building, partly of Decorated English, partly of Perpendicular architecture, with a pinnacled tower at the west end. It has some good monuments. The town has a horse-hair manufactory. The free grammar-school was originally established by the brothers Fitzjames, bishop of London and lord chief-justice, in 1520, but now dating from Edward VI. There is also a well-endowed hospital for the support of poor men and women, and for the maintenance and education of a certain number of children. In the neighbourhood are Creech Hill, crowned by a small camp, and Stowhead, the beautiful seat of Sir H. Hoare, Bart. Population, 1819.

BRUTUS, DECIMUS JUNIUS, is conjectured to be the son of a father of the same name, who was consul B.C. 77. On his adoption by A. Postumius Albinus he took the name of Brutus Albinus. Shakespeare has called him Decius, and both he and Voltaire in many particulars have confounded him with Marcus Junius. He had, however, the confidence of the Dictator Cæsar, whom he prevailed on to come to the Senate-house on the Ides of March, against his own intention and the remonstrances of his wife Calpurnia (Plutarch, "Cæsar," 64). He had served under Cæsar with distinction in Gaul. Nevertheless he joined in the conspiracy against him.

Cæsar had appointed him commander of his cavalry, consul for the year B.C. 42, and governor of Cisalpine Gaul, in which province Brutus attempted to support himself on the banishment of the other conspirators. Brutus could not maintain the field against Mark Antony, who had been elected at Rome to supersede him, and threw himself into Mutina (Modena). Antony was defeated before Mutina, B.C. 43, by the consuls Hirtius and Pansa, assisted by Octavianus Cæsar, and fled across the Alps, but soon returned in full force. Brutus, who designed to escape into Macedonia to M. Junius Brutus, was seized by Camillus, a Gallic chief, and put to death by order of Antony. (Appian, "Civil Wars," iii. 74, &c.)

BRUTUS, LUCIUS JUNIUS, founder of the Roman Republic, having early lost his father and elder brother by the cruelty of Tarquin, is said to have feigned imbecility of mind in order to secure his personal safety. The appearance of a snake in a wooden pillar of the palace occasioned great anxiety among the Tarquins, and Titus and Aruns, sons

of the tyrant, were sent to consult the oracle of Delphi. Lucius Junius, who had received the name of Brutus (the dullard), accompanied the king's sons. On his entrance into the temple, the offering which he made to the god was a bar of gold, inclosed in a staff of cornel-wood hollowed for its reception, and intended to be emblematic of his own situation. When the princes had finished their commission, they inquired which of them should reign at Rome. A voice from the adytum replied, "That one of you shall obtain sovereignty at Rome who shall first kiss his mother." Brutus stumbled and kissed the earth as the common mother of all mankind.

After the violence done by Sextus Tarquinius to Lucretia, Brutus was one of the kinsfolk whom the injured matron summoned to hear her complaint. He plucked the dagger from the bosom of Lucretia, and throwing aside the semblance of fatuity which he had assumed, he solemnly devoted himself to the punishment of the race of Tarquin, and the abolition of the regal power at Rome. Tarquinius Superbus was driven into exile; and Tarquinius Collatinus, widower of Lucretia, and Brutus, were made the chief magistrates under the title of consuls. This revolution occurred 507 B.C.; and the Republic of Rome, so famous in the world's history, was thus founded by Brutus. On the discovery of a plot for the restoration of the Tarquins, their property was confiscated. The conspiracy involved many of the noblest Roman youths, and among them Titus and Tiberius, sons of Brutus. The culprits were tried and condemned by their own father, who also witnessed their punishment. Several Etruscan cities next took arms under Porsetius in behalf of the Tarquins, and Brutus headed the cavalry by which they were opposed. Aruns Tarquinius and Brutus encountered one another, and both of them fell in the shock. (Livy, Niebuhr, &c.)

BRUTUS, MARCUS JUNIUS, principal conspirator against Cæsar, was a nephew of Cato of Utica, and was born at Rome B.C. 86. It was a tradition that he was descended from Lucius Junius, the expeller of the Tarquins, but the tradition is not supported by evidence. After being divorced from his first wife, Appia Claudia (about B.C. 45), he married Portia, the widow of Bibulus and daughter of his maternal uncle Cæcilius and preceptor, Cato. Brutus was acquainted with all the Grecian systems of philosophy, but particularly attached to those of Plato's school. Afterwards, at least, he certainly adopted the Stoical tenets and discipline. When Cato, B.C. 58, was appointed, under law passed by the influence of Clodius, to annex Cyprus to the Roman empire, Brutus accompanied his uncle.

At the time of the civil war between Julius Cæsar and Pompey (B.C. 49), Brutus, whose father had been put to death by order of Pompey, sacrificed his private resentments to that which he believed to be the better cause, and he joined Pompey. After the defeat at the battle of Pharsalia (B.C. 48), Brutus was distinguished by the clemency of the conqueror.

When Cæsar undertook his expedition into Africa against Cato, he committed to Brutus the government of Cisalpine Gaul, which was administered with humanity, and he afterwards preferred him to Cassius for the office of Prætor Urbanus, and nominated him as next governor of Macedonia. Notwithstanding these favours, Brutus personally shared in the assassination of Cæsar on the Ides of March, B.C. 44. He retired to Macedonia when Mark Antony had produced a reaction among the people of Rome, and devoted himself to a preparation for war. Antony and Octavian, on one side, and Brutus and Cassius on the other, met at Philippi in Macedonia, B.C. 42. The battle was fiercely contested, but ended in the total rout of the exiles; and Cassius, unwilling to survive his defeat, fell upon his own sword. Brutus was defeated in a second battle, upon which he killed himself. He was in the forty-fourth year of his age.

Of his works, which were much praised by contemporaries, it is not certain that any have descended to us; but he was held in esteem as a writer and speaker. Cicero was a literary friend of his, and dedicated his "De Oratore" to him; so that he must have been distinguished in his own time.

[Plutarch, "Brutus;" Appian, "Civil Wars," ii. 11, &c.; Cicero's "Letters and Orations;" Dion Cassius, lib. 41-48.]

BRUX, a town of Bohemia, Austria, situated 14 miles N. of Saatz, on the Billa. The famous spring of Seidlitz is in its neighbourhood. It has coal-mines, and a large quantity of salts are prepared from its mineral springs.

BRUYÈRE, JEAN DE LA. Notwithstanding the well-merited popularity of La Bruyère's works, scarcely anything is known of his private life. He was born at Paris in 1645. After filling the office of treasurer of France at Caen, he removed to Paris. He was appointed teacher of history to the Duke of Bourbon, son of the great Condé, under the direction of Bossuet. In 1687 he published his work entitled "Caractères de Théophraste, traduits du Grec, avec les Caractères ou les Mœurs de ce Siècle," was admitted into the French Academy in 1693, and died of apoplexy at Versailles, 10th May, 1696.

He is represented by the Abbé d'Olivet as a philosopher whose happiness consisted in passing a life of tranquillity, surrounded by his friends and his books. He was polished in his manners, but reserved in his conversation, and free from pretension of every kind. La Bruyère, in his observations on character, though rarely profound, is always judicious, natural, and nicely discriminative; and if his views of human nature are not very extensive, he amply compensates for the deficiency by the closeness of his inspection. He took the living celebrities of his age as his subjects, and described their characters under thinly-disguised names. His work at once grew into popularity, gaining him "many readers and many enemies," as he said. It is especially interesting to Englishmen, since the great school of essayists of Queen Anne's time, Steele, Addison, &c., avowedly modelled themselves on it. It will always remain a fascinating work, for the same reason which accounts for the ever-fresh fame of his greater English counterparts.

BRYA is a genus of plants belonging to the order LEGUMINOSÆ, and remarkable as one of its species, the West Indian bay tree (*Brya ebenus*). This tree—or, more properly, arborescent shrub—grows from 15 to 20 feet high, or even more, but the trunk is not more than 3 or 4 inches in diameter. The flowers are of an orange-yellow colour, and the leaves are like those of the box. The wood is very hard and heavy, and is greenish-brown in colour; it is not the true ebony, which is procured from various species of *Diospyros*.

The genus *Brya* consists of only three species, shrubs, natives of Central America and the West Indies. It is characterized by the stamens being connate into a sheath, split above; by the ped. being flat and thin, of one or two lobes, the upper margin straight, the lower curved; and by the lobes being one, three, or several.

BRYONIN ($C_4H_8O_2$) is the bitter principle extracted from the root of the common bryony (*Bryonia dioica*). It is soluble in water, a drastic purgative, and poisonous.

BRYONY is the common name for the genus of plants *Bryonia*. The wall-bryony of our hedges is *Bryonia dioica*, a plant formerly much employed in rural pharmacy. It was chiefly employed on account of the powerful drastic properties of its root-stock, which on that account the French call *marc du diable*. Over-doses are extremely dangerous, and sometimes even fatal. The root-stock is long and tuberous, with a very disagreeable odour. The stems are annual, hairy, and climb the sides of the hedges by means of tendrils, after the manner of its ally, the cucumber, both belonging to the same order, Cucurbitaceæ. The tendrils are interesting objects, as they exhibit a reverse spiral,

part of the tendril coiling in one direction, and another part in the other direction. [See TENDRIL, and Darwin's "Movements and Habits of Climbing Plants."] There are twelve species of *Bryonia*, natives of the temperate and tropical regions of the Old World. The root-stocks of many of these are actively cathartic. The genus is characterized by its unisexual flowers; the calyx campanulate, with five small teeth; the male flowers disposed in clusters or racemes; the stamens five, in three bundles, with the filaments short, and connective, not produced; the ovary with three placentas; and fruit a globular shortly-stalked berry with few seeds. The black bryony of our hedges is a plant belonging to a different order. It is the *Tamus communis* of botanists, and can be readily distinguished by its shining, hairless, heart-shaped leaves. [See TAMUS.] Its tubers have acrid, purgative, and emetic properties.

BRYOPHYLLUM, a succulent genus of plants belonging to the order CRASSULACEÆ, and remarkable for the singular property possessed by its leaves of budding from their margin. If a leaf, or even a portion, is laid on the earth, buds will arise, root into the ground, and grow into new plants. This circumstance is especially interesting to botanists, inasmuch as it illustrates the growth of ovals on the margins of the carpellary leaves forming the ovary. The best known species is *Bryophyllum calycinum*, a shrub found in the tropics. There are three species, natives of tropical Africa. The genus is characterized by its large inflated calyx with four divisions, the corolla urceolate with four lobes, eight stamens in two series, and four free carpels.

BRYOZO A. See POLYZOA.

BRYUM, a genus of plants belonging to the MOSSES. The species of this genus are exceedingly numerous, and are found very abundantly in Great Britain. The capsule is pear-shaped, and nodding; the peristome is double, the outer consisting of sixteen teeth, and the inner of a membrane divided half-way into sixteen keeled segments. The stems are perennial, with innovations below the terminal flower. There are forty-six species enumerated in Hobkirk's "Synopsis of the British Mosses."

BU BALINE (*Alephthus bubalus*) is an ANTELOPE widely distributed over the entire regions of Northern Africa, being especially abundant in Barbary. It is gregarious in its habits, and naturally docile in disposition. By the Arab natives it is termed the wild ox, or *bekker-el-wash*. It is a large species, and is readily distinguished by its remarkably compressed and straight forehead. The horns are of moderate length, lyrate, stout at the base, and surrounded by distinct rings throughout. The hair is of a bay colour.

BUBASTIS, an Egyptian deity, after whom the large town of Bubastis in Lower Egypt was named. The town was situated on the east (Pelusiac) branch of the Nile, and lost its importance after the Persian conquest of Egypt. The canal of Necho started from it for the Red Sea. It corresponds to the Pi-beseph of Scripture. The goddess is represented with the head of a cat, her sacred animal, and was the divinity of the moon. She was the daughter of Osiris and Isis, and was one of the eight greater gods of Egypt.

BUBBLE-SHELL is the common name of the Bullidæ, a family of molluscan animals belonging to the order GASTEROPODA. In this family the shell is thin, convoluted, cylindrical or spherical, with a long rounded aperture; the spire is usually concealed; the lip is sharp, and there is no operculum. The shell is more or less covered by the lobes of the mantle. The head consists of a flattened disk, which is formed by the fusion of the dorsal and labial tentacles. The bubble-shells are all carnivorous in their habits, swallowing their prey entire; the stomach is furnished with a muscular gizzard armed with calcareous plates.

The genus *Bulla*, to which the name Bubble-shell is sometimes restricted, has an oval shell, external or only partially invested by the animal. The aperture is longer than the shell, and rounded at each end. The foot is short and quadrate. The gizzard is furnished with three plates. The species are rather numerous, about fifty recent having been described, and the fossil amounting to seventy. They are inhabitants of all temperate and tropical seas, being found on sandy mud flats, sliny banks in estuaries, and in brackish water near the sea. At low water they may occasionally be seen concealing themselves in the mud or under sea-weed, where they have been observed exuding large quantities of mucus to maintain the moisture of their skin. Their food consists of small bivalve shells, which they are able to crush and triturate by means of their powerful gizzards.

The genus *Acera*, a species of which is figured in the Plate GASTEROPODA, has numerous hooked teeth on the tongue, and horny teeth on the gizzard. There are seven widely-distributed species. The genus *Aplustrum* [see Plate GASTEROPODA] is remarkable for the size of its foot, which extends beyond the shell all round. The genus *Scaphander* has a distinct oblong shell not covered by the animal. The head is destitute of eyes. The gizzard is formed of two large trigonal calcareous plates, and a small narrow transverse plate. The shell and animal of *Scaphander ligarius* are figured in the Plate GASTEROPODA. *Philine aperta* [see same Plate], the typical species of the genus *Philine*, is a slug-like animal, with an oval shell which is entirely covered by the mantle. The gizzard is formed of three longitudinal shelly plates. Eyes are wanting. Of the remaining genera, the shell-less *Gastropterion* and *Amphispheya*, in which the animal is entirely retractile into its shell, may be noticed. Numerous species of this family are found fossil, commencing from the Ordovician series down to beds of recent date.

BUCCANEERS, a most numerous and well-known association of sea-robbers or pirates, who were also called *Elibustiers* or *Fillibusters*. The buccaneers were natives of different parts of Europe, but chiefly of Great Britain and France. They were originally hunters who had settled on the island of Haiti, after the Spaniards had exterminated the original inhabitants, for the purpose of hunting the wild cattle and hogs which roamed at will through the forests. The small island of Tortugas was their market, where they disposed of their salted and smoked meat, hides, tallow, &c., for powder, lead, and other necessities. The places where they prepared the slaughtered carcasses and smoke-dried their meat were called in the native tongue *boucans*, whence the name of *boucanier* or *buccaneer*. These men lived in couples, no women being allowed in their companies; and they had entire community of goods, bolts and locks being unknown among them. They acknowledged no laws save their own, which they called the "customs of the coast," and so pleasant did they find their wild independent life, that it is recorded that several amongst them relinquished good inheritances awaiting them in Europe rather than give it up. Though they were useful in the way of trade to the Spaniards, the determination of the latter to keep the New World as the exclusive possession of Spain, caused them to resolve on the extermination of these hardy hunters. They accordingly attacked them treacherously and by surprise, and slaughtered a large number in the most wanton manner. The remainder banded themselves together, and carried on a desperate warfare in their own defence. They frequently defeated much larger forces of the Spaniards, but the latter, by killing off all the wild cattle on which they subsisted, forced them to take to the sea. Here they were joined by many more of the hardy adventurers of Europe, who still considered the New World as an Eldorado where gold and treasures were to be had for the fetching, and this made

them brave the monstrous cruelties of the Spaniards. A permanent state of hostilities was thus established in the West Indies entirely independent of peace or war at home. The buccaneers, now no longer hunters but rather companies of privateers, increased in numbers, and their enterprises were undertaken on a larger scale. By degrees many men of respectable birth joined the association, on which it was customary for them to drop their family name and assume a new one. Some of the buccaneers were of a religious temperament. A French captain, named Daniel, shot one of his crew in church for behaving irreverently during the celebration of mass. Captain Richard Hawkins, an Englishman, threw the dice overboard on finding them in use on the Sunday; and the first thing Captain John Watling did was to order his robbers to keep holy the Sabbath.

The adventures of the buccaneers form the subject of many interesting volumes. It must suffice us here to state that the names of a few of the principal were, in addition to those already mentioned, Peter of Dieppe, called "Peter the Great;" Bartolomeo Portuguese; Francois L'Olonnais; Mansvelt; Henry Morgan, a Welshman, who succeeded Mansvelt in a sort of general command, took and plundered the town of Puerto del Principe in Cuba, attacked Puerto Bello, one of the best fortified places in that part of the world, and forced his way across the Isthmus of Darien, from the Atlantic Ocean to the Pacific; William Dampier, and Lionel Wafer, each of whom in after years wrote and published an account of his adventures, with a description of the country. Morgan gradually became less disorderly, and finished as deputy-governor of Jamaica after having been knighted by Charles II. Their greatest exploit was the combined attack on *Cathagen*, its capture, and the sharing of enormous plunder gained by its pillage, in 1697; but almost at once this was followed by the treaty of Ryswick, and four years later the accession of a French Bourbon prince to the throne of Spain brought about the final disappearance of the buccaneers. The word long survived a describing lawless piratical adventures, such as up to comparatively recent times were only too readily to be found in the West Indies.

BUC' CINA, a military instrument of the shrill horn or trumpet kind, in use among the ancients, and formed of the horn of the bull or goat, carved in imitation of the shell of the buccinum, of which it was originally made, the buccinum being a long slender spiral univalve shell. Vegetius (*De Re Militari*) says that it was often made of brass, and bent in a cyle. *Blancini* (*De Instrum. Vet.*) also states that it was often a metallic instrument; but from the engraving he gives of it, after ancient bas-reliefs, the buccina would appear to have been perfectly straight. The chief office of the buccina was to proclaim the watches of the day and night, and hence, like the sailors' "six bells," "eight bells," &c., the Roman watches came to be called *buccina prima*, *buccina secunda*, &c. It was also blown at funerals, and (like our similar use of the trumpet in the middle ages) at great banquets.

From the buccina comes the name of the important *buccinator* ("trumpeter") muscle, the great muscle of the cheek, forming the side wall of the mouth, and by its contraction after having been puffed out in the manner characteristic of trumpeters enabling a current of wind to be expelled.

BUCCINUM. See WHITE.

BUCENT'AUR (*Il Bucentoro*), the state-galley of the republic of Venice, for the name of which many very unsatisfactory derivations have been proposed. It was chiefly used to celebrate the marriage of the Adriatic Sea to the state of Venice, a grant said to be made by Pope Alexander III. in reward for a victory obtained in the year 1177 by the Doge Sebastiano Ziani over the Emperor Frederick Barbarossa, then opposed to the pope. For this purpose the Bucentaur was conducted, on the eve of

the feast of Ascension, from the arsenal to the piazza; and then, accompanied by innumerable feluccas and gondolas, it passed on to the mouth of the Lido amid the thunder of artillery, where, with many ceremonies, the doge dropped a ring into the bosom of the Adriatic, betrothing her by these words: "We wed thee with this ring in token of our true and perpetual sovereignty." The Bucentaur was burned by the French when they took possession of Venice during the revolutionary war. It was about 100 feet long, measured 21 feet amidships, and was rowed by large sweeps manned by 168 rowers, several to each oar, filling the lower decks. The upper deck was kept quite free, to accommodate the doge and his splendid retinue.

BUCEPHALUS was the name of the famous charger which bore Alexander the Great through most of his Indian campaign. It was the finest horse of the time, as is evident in the enormous price of 13 talents (£3500) paid for it by Philip of Macedonia, Alexander's father; and it was so powerful and fiery that every one was afraid to break it in. Alexander himself tamed it, and on its death, in Asia, in B.C. 327, was as inconsolable as if he had lost an intimate friend. Bucephalus was buried in a splendid manner by its master, on the banks of the Hydaspes (Indus) in the Punjab, and the town of Bucephala founded in its honour. It still exists in the modern Beluchistan. Perhaps one reason for Alexander's fondness for Bucephalus lay in the fact that in taming a horse whom no one else could tame he had tamed an oracle, which laid that down as a condition for the next king of Macedonia after Philip.

BUCEP. MARTIN, was born in 1491 at Alsace. His real name was Kuhlhorn ("cow-born"), which he changed to Bucer, its Greek equivalent. Having entered the order of St. Dominic, he received his education at Heidelberg. He adopted the opinions of Luther in 1521, but afterwards more fully approached the tenets of Zwingle. At the diet of Augsburg, in 1548, he vehemently opposed the system of doctrine called the "interim," which the Emperor Charles V. had drawn up for the temporary regulation of religious faith in Germany until a free general council could be held. In consequence of this Bucer was subjected to much difficulty and danger. He accepted an invitation from Cranmer to fix his residence in England, where, shortly after his arrival, he was appointed as his professor of divinity at Cambridge, in 1550. He died at Cambridge in February, 1551. Roman Catholics hated Bucer as a powerful opponent, and during the reign of Mary, when inquisitors were sent to Cambridge, the remains of Bucer and of Eriug were dug up from their resting-places and burned. Bucer's influence tended more than that of any other foreigner to turn the current of the English Reformation from the Catholic direction in which it naturally ran, into that which was taken by the extreme Protestant communities abroad. Something of the extravagance of his teaching is indicated in the outrageous theological proposition which he maintained before the University of Cambridge, namely, "That all good works which men seem to perform before justification are really sins, and merit the divine displeasure; but after we are justified good actions are necessarily done by us." The use of church bells he declared to be anti-Christian; and that of vestments, including the surplice, highly objectionable, though not actually sinful. He was also one of the party which endeavoured to forbid kneeling at prayers and the reception of the communion.

On New Year's Day, 25th March, 1550, Bucer presented Edward VI. with the manuscript of a work which he had written in Latin, "Concerning the Kingdom of Christ." In this work Bucer pressed the king to introduce a stern system of ecclesiastical discipline, under which punishments, especially excommunication and death, were to be dealt out broadcast. Able-bodied men and women who would not work were, for example, to be excommunicated;

men and women who committed adultery were to be put to death; and all the capital punishments ordered in the Mosaic Law were to be adopted into the law of England. This book made a great impression upon the mind of the young king. The place which this so-called "discipline" afterwards assumed in the ecclesiastical plans of the Puritans is well known. It was a system of religious tyranny which would have been intolerable to Englishmen, but it is supposed that Edward VI. was resolved to introduce it; and that if he had lived to come of age he would, with Tudor determination, have imposed it on the nation.

BUCHAN, a district in the county of Aberdeen, Scotland. It covers the N.E. portion of the county, and contains the most eastern point of Scotland. Its surface is uneven, but the hills nowhere reach a great height, the most elevated point being the coffin-shaped hill of Mormond, 742 feet above the sea. The coast in many places presents a bold and fine appearance, the fragments of rock left from the wearing action of the sea often assuming fantastical architectural shapes. Near Stirling Hill, where there are granite quarries, are the famous *Bullers of Buchan*. This is a huge natural wall surrounded by perpendicular rocks, with a small entrance only a few feet wide; through this in stormy weather the sea rushes with fearful violence.

Buchan gave a title to the family of the Comyns, who were the enemies of Bruce, and whose earldom was forfeited in 1309.

BUCHAN NESS, a promontory in the district of Buchan, the most eastern point of Scotland, lies about 3 miles S. of Peterhead. A lighthouse 130 feet high is erected here. Off this point there reaches, for a distance of about 25 miles, a depth of from 50 to 90 fathoms, which is known as the *Buchan Deep*. Though *Buchan-Ness* may be considered the most eastern point of Scotland for all practical purposes, the low rocks of Peterhead in fact stretch further east.

BUCHANAN, GEORGE, an eminent Scottish scholar and poet, was born of poor parents, in the parish of Killearn and county of Stirling, in February, 1506. By the death of his father and the insolvency of his grandfather, he and the rest of the children were thrown upon the care of their widowed mother and the friendship of more distant relations. He was educated first at the University of Paris, and afterwards at that of St. Andrews, and notwithstanding severe struggles with poverty succeeded in becoming Bachelor of Arts on the 3rd of October, 1525; and we learn from himself that in the following summer he went to France, and became a student in the *Scots College* at Paris. After a struggle of two years with "the iniquity of fortune," he obtained the situation of a regent, or professor, in the College of St. Barbe, where he taught grammar nearly three years. In May, 1537, he came to Scotland in company with Lord Cassilis, to whom he had been tutor, and who had just attained his majority; and was then appointed tutor to James Stuart, one of the natural children of James V., with a liberal allowance.

While on the Continent he had joined the Reformed Church, and at Lord Cassilis' seat he composed his poem entitled "Somnium," in derision of the regular clergy. At the solicitation of the king he also published his "*Calinodia*" and "*Franciscanus*." He was, however, seized as a heretic, and thrown into prison; and Cardinal Beaton actually tendered to the king a sum of money to consent to his death. Buchanan escaped, and got to England, and thence to Paris. Finding that Cardinal Beaton was living there at the time, he accepted an invitation from Andrew Govea, to become a regent or professor of Latin in the College of Guienne at Bordeaux. In 1547 Govea was invited to become principal of the University of Coimbra in Portugal, and was accompanied by Buchanan. His friend Govea died in the following year, upon which the Inquisition assailed him as a heretic, and shut him up in a monas-

tery. In this solitary abode he began his version of the Psalms. Being at last restored to liberty, he reached France about the beginning of 1553. In 1555 he became domestic tutor to Timoleon de Cossé, son of the Maréchal de Brissac. In 1560 he returned to Scotland, and in the beginning of the year 1562 he was classical tutor to the young queen Mary. For his services in that capacity she gave him a pension of £500 Scots a year for life, and in the year 1566 the Earl of Moray, her brother, presented him with the place of principal of St. Leonard's College at St. Andrews. The following year he was chosen moderator of the General Assembly of the Church of Scotland. In 1570 he resigned the office of principal of St. Leonard's College, on being appointed one of the preceptors of the young king James. The same year the place of director of the Chancery was conferred upon him, and shortly afterwards that of lord privy seal. In 1578 he joined in a commission to visit and reform the universities and colleges of the kingdom. The scheme of reformation suggested, and afterwards approved of by Parliament, was drawn up by him. The same year also he brought forth his treatise "De Jure Regni apud Scotos." He died at Edinburgh on the 28th of September, 1582, just after his great work on the "History of Scotland" had passed through the press. He was buried at the cost of the town.

As a man of great and various learning, and of nearly universal talent, he was without a rival in his own day. Buchanan is one of the most elegant Latin writers that modern times have produced, and he was also a good Greek scholar. He is a striking instance of the love and pursuit of knowledge in the most unfavourable circumstances, amidst poverty and disease, religious persecution, and civil discord.

There are two editions of the works of Buchanan. One is by Ruddiman, published at Edinburgh in 1715, in two vols. folio. The other is by Peter Burnan (Leyden, 1725), in two vols. 4to. In this the editor has, besides his own critical annotations, incorporated the notes, dissertations, &c., of his predecessor.

BUCHANAN, JAMES, the last pro-slavery president of the United States, was born in Pennsylvania in 1791, and admitted to the bar in 1812. In 1820 he was chosen member of Congress, and went as ambassador to Russia in 1831. He returned to the United States in 1834, and was elected a member of the Senate. In 1853 he was appointed minister to the English government, but only remained in this country two years, and on his return home was elected president by the Democratic party. At the expiration of his term of office he was succeeded by President Lincoln. He died 1st June, 1868.

BUCHAREST, BUKARESCHT, or BUKHOREST, the capital of Roumania, stands on the Dunbovitza, a feeder of the Danube, in a vast marshy plain, in 40° 26' N. lat., 26° 8' E. lon. The population in 1883 was 230,000. It is the residence of the King of Roumania, the seat of government, as well as of a Greek archbishop, and the headquarters of the foreign consuls. Bucharest is, however, with few exceptions, nothing better than a heap of wretched brick or mud cabins, ranged along lines of streets paved with trunks of trees, resting on liquid mud. From this circumstance, it has the appearance rather of an immense village than of a regular town. The place covers a space 4 miles long by 3 wide. The boyars' residences are spacious, and built of stone. The handsomest buildings are the king's palace, the metropolitan church, and the residences of the foreign consuls. There are a large number of churches, none of which have fewer than three steeples, and many no less than six; some have even nine. The town contains twenty convents, a large bazaar, one Catholic and one Lutheran church, a synagogue, and several hospitals and infirmaries. In the middle of Bucharest there is a tower, called the Fire Tower, 60 feet high, which commands a full view of every part of it. It is the great commer-

cial mart for the principality, and the inhabitants carry on an extensive trade in grain, wool, honey, wax, tallow and cattle. A railway between it and Giurgevo, a town on the left bank of the Danube, opposite Rustchuk, was opened in 1870. There are no large manufactures; but small quantities of woollen cloths, carpets, brandy, &c., are made. Bucharest was founded in the thirteenth century by Radel the Black, of Wallachia, but was little heard of until the eighteenth century, since which it has frequently suffered in various Turkish wars. The treaty of 1812 was signed here, 28th May, by which Turkey ceded to Russia Bessarabia and part of Moldavia. The name of the town signifies "City of Joy."

BUCHOLZITE or FIBROLITE is a silicate of alumina crystallizing in brown rhombic prisms, with a vitreous lustre; its hardness is 6-7, and specific gravity about 3.25. It is found in gneiss and mica-schist. Many of the stone implements found in Western Europe are made of this mineral.

BUCK BEAN or MARSH TREFOIL (*Menyanthes trifoliata*) is a beautiful water plant belonging to the order GENTIANACEÆ. The leaves are long-stalked with three leaflets. The two valves into which the capsule bursts carry the seeds along their middle. The bitter principle extracted from the leaves is a tonic, and in larger doses also cathartic and emetic. In these properties it resembles *Gentiana lutea*. The leaves are used in some parts of Germany as a substitute for hops; and Linnæus mentions that it was formerly also so used in Lapland, and the powdered root-stocks, he says, are there mixed with meal for bread, which is "annuus et ætæstabilis."

BUCKFAST LEIGH, a small manufacturing town in the county of Devon, 6 miles from Totness, and 230 miles from London by the Great Western and South Devon Railways. The town was at one time celebrated for its woollen manufactures, but they have now nearly all passed away. Serges and blankets are, however, still made to a small extent, and wool-combing is carried on. There is also a large paper mill, and limestone is extensively quarried and burned for lime in the surrounding neighbourhood. The church is a fine cruciform building placed on an eminence overlooking the Dart, and near it are some remains of an ancient Cistercian abbey, which is said to have been founded long before the Norman Conquest, and to which Canute gave the manor of Zeal Monachorum. It is mentioned in Domesday Book as Budestra. It belonged to the Benedictine order before passing into the hands of the Cistercians. The remains adjoin the modern mansion of Buckfast Abbey. Population, 2802.

BUCKINGHAM, BUCKINGHAMSHIRE, or BUCKS, an inland county of England. It is bounded N. and N.W. by Northamptonshire, W. by Oxfordshire, S. by Berkshire, and E. by Bedfordshire, Herts. and Middlesex. Its greatest length, measured nearly N. and S. from the neighbourhood of Olney to the river Thames above Staines, is 53 miles. Its breadth varies much, the greatest being 27 miles. The total area is 167,009 acres. In 1881 the population was 173,514.

The principal hills in Buckinghamshire are the Chilterns, a chalk range, which, entering the county from Oxfordshire, runs across it in a north-eastern direction, and enters Bedfordshire near Dunstable. Two elevations (near Ivinghoe and at Wendover) are 904 and 905 feet high. The Chiltern district was once nearly covered with forests, and there are still large woods of beech-trees.

The Thames is the chief river of the county, which it separates from Berkshire and Surrey, receiving in its course a few small streams from Buckinghamshire. The Colne, which separates Buckinghamshire from Middlesex, is a good fishing stream, but not navigable. The Thames rises between Aylesbury and Fenny Stratford, and leaves the county near the town of Thame. The Ouse, which is chiefly

a Northamptonshire river, traverses the northern part of Buckinghamshire; the Ousel is one of its tributaries.

The Grand Junction Canal runs through the county from Wolverton to Marsworth, and sends off branches to Buckingham, Wendover, Aylesbury, and Stony Stratford. There are also good turnpike roads, and the county is well supplied with railway accommodation.

The south-eastern part of the county, included between the Thames and the Colne, is occupied by the plastic clay which skirts the London clay. Only a very small portion of the London clay is found in Buckinghamshire, in the neighbourhood of Staines. The chalk underlies the plastic clay, and rises from beneath it, forming the range of the Chiltern Hills. The chalk marl, which is generally found skirting the chalk, rises from beneath it, and is in turn succeeded by what is termed Tetsworth clay. Sandstone, more or less ferruginous, crops out from beneath this clay, and is succeeded by the Aylesbury limestone. These formations, which lie beneath the chalk, are much covered and concealed by the debris of the chalk hills. The chalk marl and the succeeding Tetsworth clay form the soil of the fertile vale of Aylesbury. Two members of the Oolitic series appear in different parts of the county.

Agriculture.—The climate of Buckinghamshire is mild and healthy. Westward of the Chiltern Hills lies the fertile vale of Aylesbury, northward of which are some inferior soils of poor wet clay. Near Bedfordshire there are some light sandy soils. On the south east of the county the surface is more varied, there being several depressions or valleys on the eastern slope of the chalk, in which some good loams occur. The mixture of chalk with the clay forms a soil well suited to wheat and beans. Further east from the chalk hills are various undulations of the surface, with corresponding variations in the soil; and the remaining parts of the county are much diversified in soils.

According to the official agricultural statistics published in 1883, there were 407,000 acres, or nearly eight ninths of the entire area, under cultivation. The chief crops were wheat, 52,000 acres; barley, 29,000; oats, 26,000; beans, 12,000; turnips and swedes, 18,500; clover, 36,000; and permanent pasture, 208,000.

The state of farming in many parts of the county is excellent, the farmers generally being men of capital and intelligence. Drainage has been almost universally adopted, and the best implements are rapidly brought into use. The farm houses and buildings, especially those most recently constructed, are substantial and well arranged, but there is still very great room for improvement as regards the labourers' dwellings. The live stock in the county in 1883 consisted of 18,000 horses, 66,000 cattle, 188,000 sheep, and 40,000 pigs. The cows are chiefly short-horns, Galloways, and home-bred. The large Hereford oxen are preferred for grazing where the land is very good. Both breeding and grazing is extensively carried on, and the greatest possible care is evinced in the selection of the stock.

A little cheese is made in Buckinghamshire, but the quantity of butter is much larger, being now estimated at over 500,000 lbs. annually—both that and milk and cream cheese, to demand a ready sale in London. Many of the calves in the dairy farms are fattened for veal, also for the London market. The sheep of the vale of Aylesbury are noted for the weight and fineness of their fleeces. Strong black horses, fit for dray horses, are bred in the county; and the rearing and fattening of ducks, for the early London season, is carried on to a large extent, at least £20,000 worth being taken from Aylesbury and its neighbourhood every year.

Lace, paper, and straw-plait are the chief manufactured productions of the county. Wooden chair-making (at Wycombe), wooden goods of all kinds (at Chesham), tanning, shoemaking, and malting also give employment to many hands. Oak and beech timber is grown in large quantities.

The North-western and Great Western Railways and the Grand Junction Canal intersect the county.

Divisions, Towns, &c.—Buckinghamshire is divided into eight hundreds—three of them, viz. Stoke, Burnham, and Desborough, being the "Chiltern Hundreds." The county is in the diocese of the Bishop of Oxford, and the Norfolk circuit; the assizes are held at Aylesbury. For parliamentary purposes the county is divided into three divisions, each of which returns one member to the House of Commons. Aylesbury, Buckingham, and Marlow were deprived of their representatives by the Redistribution Act of 1885.

Civil History and Antiquities.—Buckinghamshire was included by the Romans in Flavia Cæsariensis. Some of the Roman roads crossed this county. The Watling Street coincides with the modern road to Holyhead in that part of it which runs from Brickhill to Stony Stratford through this county. The Ikenild Street runs along the edge of the Chiltern Hills, and a road runs nearly parallel to it under the hills, which is called by the country people "the lower Acknell way." There are vestiges of three other Roman roads in the county, and of several stations, camps, and earthworks.

In the civil war under Stephen and under John, Buckinghamshire was the scene of contests, but not of any marked event. Hanslope Castle, near Stony Stratford, held for the barons against John by its owner, was taken by the king's favourite, Fulke de Brent, in 1216 or 1217. In the time of Charles I. the opposing armies in the civil wars contested many places in Buckinghamshire.

Of the ancient remains of feudal and ecclesiastical structures the following are the chief:—Lavendon Castle, Whitchurch Castle, Hanslope Castle; the abbey and monasteries of Burnham, Medmenham, Missenden, Nutley, Mursley, Ashbridge; and the churches of Stewkley, Hitchenden, Stantonbury, Upton, Water Stratford, Dinton, Chetwode, and Hillesden.

BUCKINGHAM, a municipal borough, and the county town of Buckinghamshire, 5½ miles N.W. from London by road, and 61 by North-western Railway.

Buckingham is mentioned in the Domesday Survey. It had a staple of wool fixed by Edward III., but it does not appear to have sent members to Parliament before 1514. Under the Municipal Reform Act, Buckingham has four aldermen and twelve councillors, but it is not divided into wards. The municipal borough contained in 1881 a population of 3585. It was formerly a parliamentary borough, and until the Reform Act of 1867 it returned two members. By this measure, however, the number was reduced to one, and by the Redistribution Act of 1885 the town was deprived of a direct representative.

The town is pleasantly situated on a bend of the river Ouse, which is crossed by three bridges. The houses are principally of brick. The public buildings are the large and handsome church, with a spire 150 feet high. An elegant Gothic chancel, designed by Sir G. G. Scott, a native of the town, was added in 1866, and the nave has since been improved. There are several Dissenting chapels, town-hall, literary institutions, grammar-school and chapel of Edward IV.'s reign (restored in 1858), green-coat and other schools, and three banks. No important manufacture is now carried on; but there are malt-houses, a tannery, and wool-sorting works, and a little lace is still made. The market, on Saturday, is well attended. In the neighbourhood are paper and corn mills and a few lime quarries. Stowe, the beautiful seat of the Duke of Buckingham, is about 3 miles from the town, the road to it being through an avenue of lofty trees, which forms a favourite promenade. Buckingham is supposed to have derived its name, at a very early date, from its situation in a forest abounding with deer—"Bocca-ing-ham," the village of the stag meadow; but others give the origin

as "Buccingham," the home or place of beech-trees. Edward the Elder fortified it with earthen ramparts in 915 against the Danes, but it was captured by them in 1010. It is mentioned as a small place in Domesday Book. In the reign of Edward III. Buckingham had a considerable trade in wool, but on the removal of the staple to Calais the trade of the town declined, and it had relief granted as a decayed trading town, by Parliament, in 1335. After this lace-making became the chief trade of the place, but the application of machinery to the manufacture destroyed to a great extent the employment of pillow-lace making. In 1644 Charles I. made Buckingham his headquarters, and Waller and Fairfax at different periods held the town. In 1724 it suffered from an extensive conflagration, which burned down the greater portion of it. Before the Reformation the shrine of St. Rumbald, in the parish church, attracted pilgrims to the town. The ducal title of the Temple family is derived from the town.

BUCKINGHAM, EDWARD STAFFORD, DUKE OF, the last Constable of England, and the last Buckingham of the house of Stafford, was the son of that Duke of Buckingham whom Richard III. beheaded (and of whom Shakspeare did *not* say, "Off with his head, so much for Buckingham!" a line interpolated by Cibber). He was therefore descended from Edward III., through Anne, granddaughter of that king. The attainder fixed on his family by Richard III. was removed by Henry VII., and he became enormously rich. His royal descent, and indeed distant claims on the throne, his wealth, and his popularity inflated him to the point of bearding Wolsey in his Spanish policy, the duke, in common with most of the peers, wishing to stand well with Spain in order to recover the French possessions lost under Henry VI. less than a century before. Finally he threatened Wolsey that if Henry died he would bring the cardinal's head to the block. Wolsey represented this to Henry as tantamount to "imagining the king's death," and aiming at the crown. Henry, still without a son, and jealous of the point of succession, had the duke arraigned for high treason on these points, and executed on Tower Hill, May, 1521. Henry seized the noble's great possessions, Wolsey gratified his revenge, and a great blow was struck at the peers in their opposition to the king's policy. The office of Constable of England (which may be roughly likened to commander-in-chief), which the duke inherited from the Bohuns, earls of Hereford, was forfeited, and was never after revived in England.

BUCKINGHAM, GEORGE VILLIERS, DUKE OF, third son of Sir George Villiers, was born in 1592, at Brookesby in Leicestershire. His education appears to have been undistinguished by any proficiency in literature; but, on his return from a three years' visit to France, he was well skilled in all bodily exercises, and in 1615 he was introduced at court as a rival to the then favourite, Carr, earl of Somerset. James no sooner knew him than he attached him to his own person as cup-bearer, and familiarly gave him the name of Steenie. Promotion followed very rapidly, and he successively became a knight and gentleman of the bedchamber, with a pension of £1000 a year out of the court of wards. On the following New Year's Day he was made master of the horse, and installed knight of the order of the Garter. In August he was created Baron of Whaddon and Viscount Villiers; and in January, 1616, he was advanced to the earldom of Buckingham, and sworn of his majesty's Privy Council. Scarcely another year elapsed before his patent was made out as marquis; he was appointed lord admiral of England, with many other dignities. In 1623, having become as great a favourite with Charles, prince of Wales, as with the king, he was the companion of the prince in his romantic expedition to Madrid to see in his own person the Infanta of Spain, who had been proposed for his future bride. This marriage, unpopular in England, failed, greatly through Buckingham,

who on his return was hailed by the country as "saviour of the prince." He had been created a duke during his absence, and upon his landing he was nominated lord warden of the Cinque Ports. The war with Spain which ensued, the marriage with Henrietta Maria of France (with its daring episode of the passages of gallantry with Anne of Austria, the queen-mother, on Buckingham's part), and the impeachment of the Earl of Bristol, are sufficient proofs of Buckingham's continued ascendancy. Charles succeeded to his father's throne in 1625, and the duke still retained the high honours which he had enjoyed in the former reign, and the intimate confidence of the new king. The war with Spain, although undertaken without due grounds, was popular; but the ill success which attended an expedition against Cadiz was seized on by the Commons, under the leadership of Sir John Eliot, as an opportunity for the impeachment of Buckingham. His greed and corruption, his culpable extravagance, his insatiable ambition, his seizure of all authority, and his neglect of public duties had long exasperated all thoughtful men. Charles threw Eliot into the Tower, but the Commons refused to sit till he was restored. They were for proceeding with the impeachment, but the king fiercely dissolved the Parliament, and burned the Commons' remonstrance with his own hand. In May, 1627, Buckingham undertook in person the conduct of the expedition for the relief of Rochelle, from which he returned, according to the language of Hume, "totally discredited both as an admiral and a general, and bringing no praise with him but the vulgar one of valour and personal bravery."

Another attempt was to be made to relieve Rochelle, and while at Portsmouth, superintending the preparations, the Duke of Buckingham was assassinated by John Felton, 24th August, 1628.

BUCKINGHAM, GEORGE VILLIERS, DUKE OF, second son of the preceding, was born in London, 30th January, 1627. He was educated at Cambridge, under the especial patronage of the king; and after travelling with his brother, Lord Francis Villiers, he returned to England on the outbreak of the civil war, and espoused the royal cause. His brother was killed, and the duke himself escaped with difficulty beyond the seas. He afterwards served under Charles II. at Worcester, and was again compelled to take refuge on the Continent.

Presuming on some kindness shown to his mother by General Fairfax, Buckingham, although outlawed, ventured to return to England, and he married one of Fairfax's daughters in 1657. Cromwell then caused him to be arrested, and he continued in confinement till the abdication of Richard Cromwell. At the Restoration he recovered his paternal estates, was sworn of the Privy Council, and nominated lord lieutenant of the county of York. His political conduct, however, was most versatile, and the influence which he maintained over Charles by his talent for agreeable ridicule was most unworthily employed. He contributed to the downfall of Clarendon; he was a member of the *Cabal* ministry; he was in opposition by 1666; and is strongly suspected of being concerned in Blood's attempt on the Duke of Ormond. See BLOOD.

In 1671 he resigned the chancellorship of Cambridge, and vehemently supported the Nonconformists in their opposition to the Test Act. He was deeply engaged in the popish plot, and the remainder of his days was spent in factious opposition, and in connection with the intrigues of Shaftesbury.

On the death of Charles II., the Duke of Buckingham, finding his health ruined by a long career of vice, and his fortune diminished by unbounded extravagance, retired to his seat of Helmsley in Yorkshire, where he devoted himself to field amusements. His death occurred on 17th April, 1688, at the house of a tenant at Kirkby Moorside, after a few days' fever produced by sitting on the damp ground

often lent by a fox-chase. The picture of destitution so vividly drawn by Pope in the third of his "Moral Essays" ("In the worst man's worst room," &c.), is greatly exaggerated. The portrait which Dryden has presented under the character of Zimri in "Absalom and Achitophel" is by no means overcharged, and may be unhesitatingly received, not only on account of the fineness of its execution, but also of the justice of its features. The duke was interred under a sumptuous monument in Henry VII.'s Chapel in Westminster Abbey. With him ended the Buckinghams of the house of Villiers. The present dukedom of Buckingham is held by the Chandos family, and dates from 1822 only.

In the intervals which this remarkable man snatched from pleasure and politics he employed himself in literary composition. His comedy of "The Rehearsal" is an exquisitely humorous and highly characteristic piece. His writings were collected in an 8vo volume of miscellaneous works in 1704.

BUCKINGHAM, JAMES SILK, a modern traveller, a popular lecturer, and a prolific writer, was born in 1786. His career was marked by extraordinary vicissitudes and adventures. He was at first bred to the sea, and then became successively a printer, a bookseller, the captain of a trading vessel, a shipowner and merchant, the proprietor and editor of a newspaper and of two literary journals, and finally an author and public lecturer. He travelled extensively in Egypt, Syria, Mesopotamia, and Persia, repeatedly visited India, and in 1816 established a journal in Calcutta, which, by the boldness of its attacks upon the maladministration of Indian affairs, led to his expulsion from the presidency of Bengal, and the seizure of his printing presses. On his return to England he established the *Oriental Herald* and the *Asiatick*, the latter now an important weekly literary journal, and published his "Travels in Palestine, Arabia, Mesopotamia, &c." He afterwards made several tours through various parts of Europe and North America, of which he published a long-told account. Mr. Buckland resided in the House of Commons as member for St. Albans from 1832 to 1847. He took a deep interest in social reforms, and collected a great number of popular lectures by various parts of the country. He published two volumes of the "Arabian Nights," but died before the work was completed, 29th June, 1850.

BUCKLAND, FRANCIS TREVELYAN, son of the subject of the following article, more generally known as Frank Buckland, was born 17th December, 1826. He was educated at Winchester and Oxford, and at the latter place took his degree of B.A. in 1848. He adopted the medical profession, and obtained the appointments of house surgeon in St. George's Hospital and afterwards of assistant surgeon to the 2nd Life Guards, which latter he retained for ten years. He made natural history a special study, and published numerous works of a popular character on this subject. He received the appointment of inspector of salmon fisheries for England and Wales, and during the latter years of his life his labours were chiefly directed to the good of the fishery interests of Great Britain. He died 19th December, 1880.

BUCKLAND, WILLIAM, D.D., F.R.S., a distinguished geologist, eldest son of the Rev. Charles Buckland, was born 12th March, 1784. He received his early education at the grammar school at Tiverton and at Winchester College, and in 1801 entered Corpus Christi College, Oxford, as a scholar on the Baxter foundation. Dr. Buckland early showed his geological tendencies. He attended the mineralogical lectures of Dr. Kidd, and made frequent excursions in the neighbourhood of Oxford, the fruits of which formed the nucleus of the magnificent collection afterwards placed by him in the Oxford Museum. He took the degree of B.A. in 1804, and five years after was elected fellow of his college. In 1812 he was appointed to the chair of mineralogy, and in 1819 to the "readership of geology," which had

just been founded in the Oxford University—a position he filled with great success. His numerous papers, contributed chiefly to the Geological Society, were not less influential in consolidating the new science and enlarging its boundaries. This society was founded in 1807; he joined it in 1813, and continued for upwards of thirty years a zealous contributor on every branch of the subject. Dr. Buckland's separate works were the "Reliquiæ Diluvianæ," published in 1823, and the "Bridgewater Treatise," published in 1836. In 1818 Dr. Buckland was elected a fellow of the Royal Society, in 1821 he joined the Linnæan Society, and in 1847 was named a trustee of the British Museum. He was a most active promoter of every scientific object, and the British Association owed much in its first years to his untiring energy and sound judgment. He was its president at Oxford in 1832. For several years he was president of the Geological Society. In 1825 he was made a canon of Christ Church and Doctor of Divinity; and having resigned his fellowship received the living of Stoke Charity in Hampshire. In 1845 Dr. Buckland was appointed to the deanery of Westminster on the recommendation of Sir Robert Peel. He died on the 26th of August, 1866.

BUCKLE, HENRY THOMAS, historian, was the son of a wealthy merchant in London, and was born on the 21th of November, 1822. He first became known to the world by the colossal fragment of a "History of Civilization in England," of which two volumes were published, one in 1858 and the other in 1861. The work, which displays wide research and is elaborately written, made an epoch in the philosophy of history by the bold and paradoxical speculations in which the author indulges. It at once took a foremost place, and still remains unequalled in its own province.

Buckle's objects were to discover the essential part of a nation's history, apart from particular men and events, and he endeavoured to prove that the spirit and character of a people is dependent chiefly on material circumstances, such as soil, climate, food, the aspect of nature, &c. He also maintained that the progress of society depends upon scepticism—the retarding force being credulity—in which term, however, Buckle included some things considered matters of the deepest faith by many religious persons. He showed conclusively that excessive protection exercised towards a people by the ruling powers—whether in church or state—has almost invariably dwarfed their intellectually, and checked the spirit of freedom and civilization. The execution of Mr. Buckle's entire plan was prevented by his death, which occurred on 29th May, 1862. The volumes published are only the unfinished introduction, and consist chiefly of surveys of history, undertaken to prove the theses on which he was to base his great work. He also wrote an essay "On Liberty," and one "On the Influence of Women." His "Miscellaneous and Posthumous Works," in three vols., edited by Miss Helen Taylor, were published in 1872. His style is admirable for its purpose; lucid, precise, and yet flowing. Occasionally he allows his descriptive powers free play, and at such times he rises to a very dignified and noble eloquence.

BUCKLER, the name given in former times to a shield which was worn or buckled on the left arm. Among the ancient Jews it appears to have been about half the size of the large shield which was designed to protect the whole body (1 Kings x. 16, 17). The buckler carried by the Roman infantry was about 4 feet long by 2½ wide. It was rectangular in shape, and presented a convex surface to the enemy, being made of wood padded with skin or linen, and defended with an outer casing of iron. The edges were also bound with iron to defend the bearer against downward strokes from a sword. In mediæval times bucklers were made of various sizes and shapes—round, oval, heart-shaped, or square; wood, wickerwork, hides, and plates of horn or metal being used in their construction.

BUCKLES, metal links provided with a tongue or catch, and used for fastening certain parts of dress, as straps of shoes, waistcoat or trouser bands, &c., also for harness, trunk straps, and many other articles of leather. As fastenings for shoes they have been worn from a remote period, and allusions to their use in this way are to be found in the literature of the fourteenth century. They came generally into use in this way during the reign of Charles II., and it was soon the fashion to wear buckles made of silver and enriched with precious stones. Silver buckles, made so large as to necessitate considerable care and dexterity in walking, were often adopted by dandies as a mark of distinction, and at one period over 4000 people were employed at Birmingham alone in the making of buckles. They gave way to the use of shoe-strings about the close of the last century, but they still form part of the regulation court dress for gentlemen. On some parts of the Continent buckled shoes form part of the regular dress of the clergy; and buckles are still frequently worn as an ornament by ladies in their hats or bonnets.

BUCK-THORN, a widely diffused genus (*Rhamnus*) of the order RHAMNACEÆ, chiefly found in the temperate parts of Europe, in Siberia, and in the Himalayas at elevations of 6500 feet; also in the New World, at the Cape of Good Hope, in Australia, and the Pacific Islands. The berries of one species, the *Rhamnus catharticus*, or purging buckthorn, have long been known for their purgative properties, and still continue to hold a place in several Pharmacopœias. This property is participated in by those of other species, as well as by their inner bark. The bark of *Rhamnus frangula*, or alder buckthorn, is beginning to be substituted for the berries of the purging buckthorn, as its action is not accompanied by the severe griping and nausea which is so often the effect of the berries. The berries of several kinds form articles of commerce from the Mediterranean, under the name of French, Turkey, and Persian berries. Grains d'Avignon, &c., being valued on account of the colouring matter which they yield, and which varies from yellow to green. This M. Brongniart supposes to be owing rather to different degrees of ripeness than to essential differences in nature. Sap-green is a mixture of the juice of these berries with that of some others. *Rhamnus infectoria*, *sarothra*, *amagbainus*, *catharticus*, and *Clusia* are the species generally employed; some for dyeing morocco leather of a yellow colour, others for dyeing wool, and the bark of some for striking a black with the salts of iron. The *Lycium* of the ancients is supposed to have been a species of *Rhamnus*; hence also one species has been called *Rhamnus Lycioides*; it has a hard yellow wood. The Chinese prepare from the bark of two native buckthorns a green dye which is imported in large quantities into Lyons for dyeing silks. A similar dye has also been made from *Rhamnus catharticus*, our English buckthorn.

BUCK-WHEAT (*Eragrostis esculenta*) is found wild in Central Asia. It is an annual plant, and the flowers appear very soon after it is out of the ground. They continue to blow and bear seed in succession till the frost destroys the plant. Being a native of a warm climate, the smallest appearance of frost in spring, while the plant is tender, entirely destroys it. The cultivation of buckwheat has never been very extensive in the variable climate of Britain. It is not so well adapted to cold wet soils as to warm sands, nor is it so certain a crop as oats or barley. For countries where there are very poor light lands with a hot dry climate, unfavourable to the growth of oats and not rich enough for barley, buckwheat is a great resource. Under particular circumstances it might be introduced with advantage into many parts of England where it is now unknown. The only counties in which it is cultivated to a moderate extent at present are Norfolk and Suffolk, where it is called *brank*.

Buckwheat may be ploughed into the ground in a green state. For this purpose it is sown tolerably thick, and when the plant is in its greatest vigour and in full blossom a roller is passed over the crop to lay it level with the ground. The plough, with the addition of a skin coulter, turns it neatly into the furrows, and completely buries it. It soon decays from its own moisture, and the decomposed parts being incorporated with the soil add to its fertility.

Buckwheat is sometimes cut in its tender state for soiling cattle. It is said to increase the milk of cows, and is occasionally pastured by sheep. It may be given to horses instead of oats, or mixed with them. No grain seems so eagerly eaten by poultry, or makes them lay eggs so soon and so abundantly. The meal, when it is ground, is excellent for fattening cattle or pigs. The flour is fine and white, but from a deficiency in gluten does not make good fermented bread. It serves well, however, for pastries and cakes; crumpets made of buck-wheat flour, eaten with butter, are a favourite dainty with children in Holland. A hasty pudding is also made of the flour, with water or milk, and eaten with butter or sugar.

BUCOLICS (from the Gr. *Boukolika*) signify literally, "poems on the tending of oxen or herds generally." Bucolics are a species of poetry in dialogues, the interlocutors in which are shepherds, husbandmen, and their mistresses. Theocritus, Moschus, and Bion have written exquisite bucolics in Greek, and Virgil has adopted the style in his always delightful Eclogues. Calpurnius, a later Latin poet, has shown us, on the other hand, how tame and insipid bucolic poetry may be. The beauties of these compositions lie in delicacy of expression and refinement of language. It is an eminently artificial form of poetry, and its development in the PASTORALS of more modern times is except in the great masters named, more to the taste of the present day.

BUD or **LEAF-BUD**, in vegetable physiology, is the organized rudiment of a branch. Whatever becomes a branch is, when first organized, a bud. A leaf-bud is constructed thus:—In its centre it consists of a solid conical portion of soft succulent cellular tissue, and over the surface of this are arranged rudimentary leaves, in the form of scales. These scales are closely applied to each other; those on the outside are the largest and thickest, and the most interior are the smallest and most delicate. In cold countries the external scales are often covered with hair, or a resinous varnish, or some other cortivance, which enables them to prevent the access of frost to the young and tender centre which they protect; but in warm countries, where such a provision is not required, they are green and smooth, and much less numerous. The cellular centre of a bud is the seat of its vitality; the scales that cover are the parts towards the development of which its vital energies are first directed.

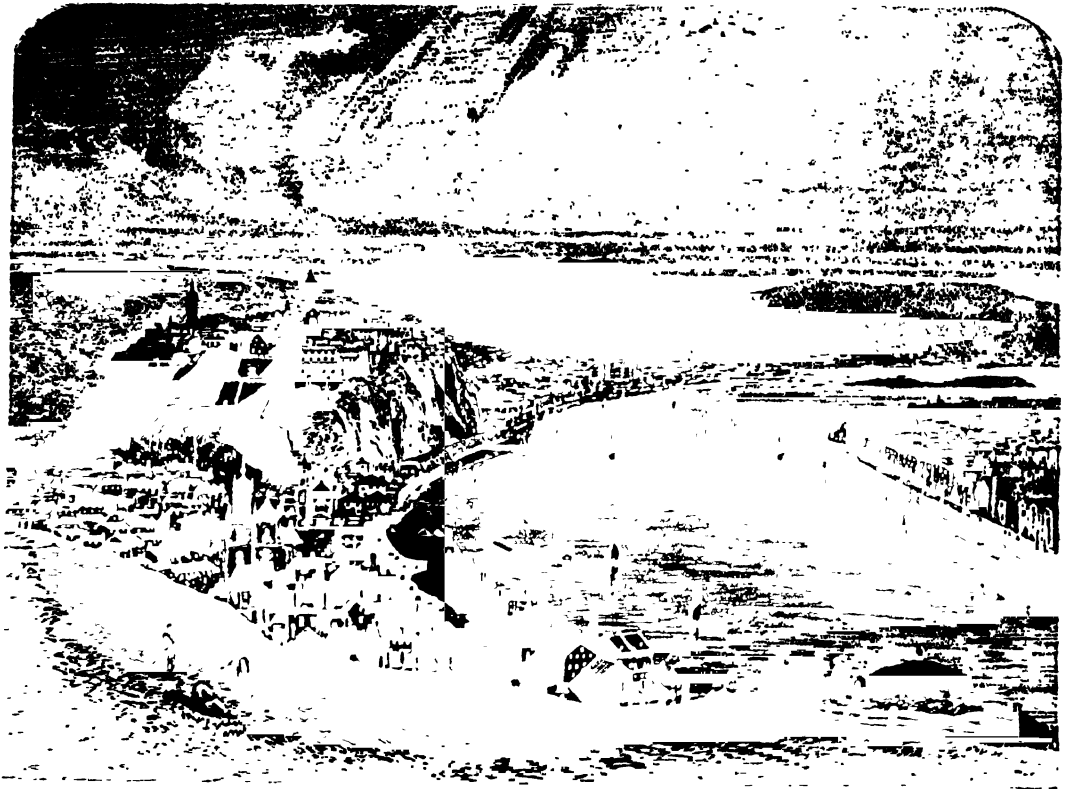
Buds generally originate in the axils of leaves, and therefore the form which the branching takes depends in great measure on the arrangement of the leaves. [See PHYLLOXERIS.] However, when plants are in an exceptional state of vitality, buds occur at various points on the stem and branches, and in some cases even on the margins of the leaves, e.g. in *BRYONIA ALBA*; these are called *adventitious* buds. They also occur on the leaves of *Begonia*, *Utricularia*, and on the roots of *Anemone japonica* and the aspen.

Every leaf-bud is in itself a complete body, consisting of a vital centre, covered by nutritive organs or *laminæ*. Although it is usually called into life while attached to its parent plant, yet it is capable of growing as a separate portion, and of producing a new individual in all respects the same as that from which it was divided; hence it is a propagating organ as much as a seed, although not of the same kind; and advantage has been taken of this for horticultural purposes. See BRIDING.

The mode in which leaves are arranged in the leaf-bud is called the *VERNATION*, and is often important in classification. Flower-buds are theoretically leaf-buds with the leaves variously modified. They develop either into solitary flowers, or branch-systems bearing flowers; this is the *INFLORESCENCE*. The way in which the floral-leaves are disposed, while still in bud, is known as the *ESTIVATION*. In monocotyledons the terminal bud only, as a rule, is developed; and this is the difference between the *trunk* of DICOTYLEDONS, and the *stock* or *caudex* of the palm and other MONOCOTYLEDONS.

BUDA, BUDIN, or OFEN, a city of Hungary, on the right bank of the Danube, about 130 miles S.E. of Vienna; is united with Pesth, on the left bank of that river, by one of the finest suspension bridges in the world; the two towns were formally united in 1873 under the name of Buda-Pesth, and this city is the capital of Hungary and the seat

of the Imperial Diet, of the Hungarian ministry, and of the supreme court of justice. Buda-Pesth is divided into ten municipal districts, but it is more convenient to treat of it under the two heads of Pesth (or the quarters on the left bank) and Ofen (or those on the right). The contrast in the general style of the two cities is very great. Buda is full of architectural variety, built in terrace upon terrace in dark and dingy masses wherever there is a space of level ground to receive it, whilst Pesth is laid out with the greatest regularity possible; the streets, crossing each other at right angles, are broad and light, and the materials used are those best calculated to preserve an appearance of uniformity even in separate edifices. Buda is built round the Schlossberg, or "castle-hill," in the form of an amphitheatre, and is situated in the midst of a mountainous and picturesque country. It is about 9 miles in circuit. The central part of Buda is called the Fortress; it rises on all



Buda-Pesth.

sides round the acclivities of the Schlossberg, on the summit of which is the citadel, and is inclosed at its foot by walls and bastions; thence the city spreads out into five suburbs. To the south of Buda there is a lofty eminence called the Blocksberg, which is very strongly fortified. It has a precipitous face to the Danube, but the slopes of the other sides are covered with houses, and on the summit there is an observatory belonging to the University of Pesth, and supplied with the finest apparatus and instruments. The Blocksberg commands a view of the Danube and the extensive plains through which it flows for an immense distance. The Fortress, which occupies about a twelfth part of the entire area of Buda, is laid out on a regular plan, and is full of handsome buildings and spacious squares. The most remarkable edifices are—the royal palace, a vast structure fronting the river, in which the insignia of Hun-

garian royalty are preserved; the Church of the Assumption, in which Francis Joseph, emperor of Austria, was crowned king of Hungary, with surpassing magnificence, on 8th June, 1867; the garrison church; the house of assembly for the Diet; the arsenal; the town-hall; and the several buildings for the various departments of the business of the state. Buda contains altogether about twelve Roman Catholic churches, a Greek church, and a Jewish synagogue. It possesses a royal gymnasium, a Roman Catholic high school, a school of design, several other educational establishments, a theatre, and many charitable institutions. Sulphurous hot springs issue from the foot of the hills at various points around the city, and have obtained for it its German name Ofen, or "oven." They have a temperature of 118°, and are used as baths—a purpose to which they were applied both by the Romans and the Turks.

Buda manufactures a little silk and velvet, leather, some cottons, and woollens. It also possesses a cannon foundry, copper and type foundries, a gunpowder manufactory, a silk spinning-mill, a tobacco manufactory, and a boat-building establishment belonging to the Danube Steam Navigation Company. The trade of the town principally consists, however, in the wines produced by the vineyards in the environs, to the annual amount of about 4,500,000 gallons. This wine, which is of excellent quality, comes from the extensive vineyards belonging to the town itself, which are said to cover an area of 70 square miles. The population of Buda in 1883 was 360,000.

Buda is believed by some writers to be either the *Cirta* of Ptolemy, or the *Aquincum* of the Itinerary of Antoninus. It was held by the Romans till nearly the end of the fourth century. Attila made it occasionally his residence. Arpad, the Magyar chief, made it his headquarters in 900, and it then became the cradle of the Hungarian monarchy. It was enlarged and improved by succeeding Hungarian monarchs, and made a free city by Bela IV. in 1245. It was taken by the Turks in 1526, but was recaptured by Ferdinand I., king of Bohemia, brother of the Emperor Charles V. It was retaken again in 1541 by the Turks, under Solymán the Magnificent, who introduced a garrison into it of 12,000 Janissaries, and reduced a great part of the kingdom to the state of a Turkish province. It continued to be the seat of a pasha until 1686, when it was retaken by the Austrians. Hither, in 1784, Joseph II. transferred the seat of government. In 1810 the Taban quarter and a part of the Water town were destroyed by fire. The city suffered a great deal in the revolutionary war of 1849. The greatest modern improvement which both Buda and Pesth have received is the suspension bridge, completed in 1849 at an expense of £650,000. The bridge, one of the finest of its kind in the world, has a clear waterway of 1250 feet, the centre span or opening being 670 feet. The height of the suspension towers from the foundation is 200 feet, being founded in 50 feet of water. The sectional area of the suspending chains is 520 square inches of wrought iron, and their total weight 1300 tons. This is the first permanent bridge which was erected over the Danube, below Vienna, since the time of Trajan. It was erected by Mr. Tierney Clark, the engineer of Hammersmith Bridge, near London. Before it was opened to the public its stability was curiously and most severely tested by the passage of the whole force of the Hungarians and Imperialists over it, the former hotly pursued by the latter. Another bridge, above the town, was completed in 1875.

BUDA'UN (*Budaon*), a district of British India, in the Lieutenant-governorship of the North-western Provinces, lying between 27° 39' and 28° 28' N. lat., and between 78° 19' and 79° 33' E. lon. The area is 2004 square miles, and the population 950,000.

The district does not materially differ in its main features from the other portions of the great plain of the Ganges. It stretches, with little diversity of surface or scenery, from the valley of the Runganga on the east to the sacred river which forms its boundary on the west, in an almost unbroken succession of ancient alluvial uplands. The district is divided into two nearly equal portions by the river Sot. The fertile upland of Budaun consists of a light loam or argillaceous soil, merging gradually into the heavier and almost barren sand of the *khur* region; but the district also comprises considerable fringes of lowland, known as *khadir* and *turai*. The *khadir* is composed of porous clay, capable of producing two crops a year for many seasons in succession, and occupies the deserted channel of the Ganges, where water may always be found at a few feet below the surface. It is specially adapted for rice, which is always grown for the autumn harvest, while barley and wheat follow immediately as spring crops. The *turai* comprises

the modern alluvial fringe along the present beds of the Ganges and the Runganga. The valley of the former river contains several large patches of *usar* land, whitened by the destructive saline efflorescence known as *reh*, which appears upon the surface after inundations or heavy rain.

Floods on the Ganges and Mahawra occur to a greater or less extent every year, and when they rise unusually high or late much of the autumn crop is carried away. The loss, however, is not considerable, as the banks of these rivers are lined with jungle, and only occasionally cultivated by speculative proprietors. The trade of Budaun is chiefly confined to agricultural produce. Good roads connect all the principal centres of population. The Ganges is navigable throughout the year for boats of large burden. The climate resembles that of other districts in Rohilkhand, being somewhat cooler and moister than the adjacent portions of the Doab, owing to the greater proximity of the hills and the damp submontane tract.

BUDAUN, an ancient city, and the administrative headquarters of the above district, lies on the banks of the river Sot, and consists of an old and a new town. The former stands on a commanding eminence, and contains the fort whose enormous ramparts of early architecture gird it round on three sides. It also has a handsome mosque, originally a Hindu temple, built of massive stone, and crowned by a dome of singular beauty. The town stands rather apart from the modern course of traffic, owing to the growth of railways, which have somewhat diverted its trade. The population is 35,000.

BUDDHISM, BUDDHA (pron. bood'izm, bood'a).

The religious system of Buddhism is the most widely spread of all the various religions of the East, and it numbers more followers than any other system in the world. From India proper, where it arose, nearly every trace of it has disappeared, but it is still the religion of the majority of the population of India beyond the Ganges, of the island of Ceylon, and several of the islands of the Indian archipelago. In addition, it has become the prevailing creed of China and of the Mongolian populations of Central Asia, through which it prevails up to the borders of Lapland, and it is one of the principal religions of the Japanese. The estimates made by European statisticians as to the number of its adherents vary considerably, but they can hardly be fewer than 50,000,000, or nearly one-third of the whole human race. Although thus numerically so important, it was not until a comparatively recent period that its history or principles were seriously studied by European scholars. Its existence had been known for a long period, and various theories, compounded of a little knowledge and a good deal of imagination, had been put forth concerning its origin; but the discovery of an important series of Buddhist writings by the British resident at Nepal, about 1828, copies of which were sent to Europe, served to put Oriental scholars upon the right track, and to open the way for more accurate knowledge. The first work of importance which resulted was that of Eugène Burnouf, published in 1844, and this has been followed by so many important contributions, that although much remains for investigation, the general outlines of the subject are now clearly defined, and earnest students are busily engaged in filling in the details. A brief outline of the more prominent points thus made known is all that can be attempted within the limits of an article like the present, but the reader will find at the end a list of the more important works devoted to the subject.

(1.) *Its Foundation*.—According to the concurrent traditions of the Buddhists, the founder of their religion was the son of a rajah named Suddhodana, whose dominions were situated on the confines of Oude and Nepal. The name of his little kingdom was Kapilavastu, his people being termed the Sakyas, and the period of his reign is placed about the end of the sixth century B.C. The real

date of the birth of Buddha is very uncertain, and while, by the Ceylonese, it is placed about 543 B.C., most European scholars regard this as erroneous, and are disposed to consider that the event occurred from 60 to 160 years later, bringing it down to about 400 B.C. In the Buddhist sacred writings which remain there is an immense amount of matter that is evidently legendary, and much that is plainly extravagant invention concerning the birth, life, and death of Buddha—so much, indeed, that some scholars have been led to deny his real existence altogether. The more generally received opinion, however, is that amidst all this fable and invention the incidents of a real life and work may be distinguished sufficiently to enable us to form a conception of one of the most remarkable of the religious leaders of men. In this story there is much that is deeply interesting, but only a brief summary can be given here. Concerning the young prince, who was named Siddhartha, but who is often called after his family name Gautama or Sakyamuni (Sanskrit, *muni*, a "solitary"), it is declared that though surrounded with luxury he gave such evidence of a contemplative disposition that his father, to prevent his embracing a religious life, *i. e.* that of a wandering mendicant, caused him to be married at an early age to a beautiful princess, and endeavored to divert his mind from such a purpose by all the means at his command. For a time these efforts succeeded, and the young Siddhartha spent some years in soft luxurious enjoyment, until the subjects of his father began to fear that their future ruler would lack the vigour necessary for his position. At the age of twenty-nine, however, he was awakened from his dreams of indolence and pleasure by the sight of a man in extreme old age, of another suffering from leprosy, of a corpse in the process of decay, and after these of an ascetic, or religious mendicant. The unsatisfying and fleeting character of all human enjoyment became deeply impressed upon his mind. His former questionings concerning the problems of human life now returned with renewed force, and after a severe mental struggle, he determined to solve the mystery, even at the cost of all that ambition, affection, or pleasure could offer. To effect this resolve he fled by night from his father's house, without even bidding farewell to his wife and newly-born son, and after divesting himself of his robes and cutting off his long hair, he embraced the life of a religious recluse. He first applied for instruction to the Brahmins, from whom he learned all they had to teach, but found himself at the end of his studies as far from the knowledge he required as ever. He next retired to the jungle, where, with five disciples, he passed six years in the practice of such rigid austerities as to bring himself to the verge of dissolution. Finding this of no avail, he began again to take proper food and to discontinue some of the severer penances, upon which he was deserted by his disciples, and he again wandered forth alone. At last, as he sat under the shade of a large tree, afterwards the sacred Bo Tree, spending his time in earnest meditation, the clouds rolled away from his mind, and in an ecstasy of joy he felt he had discovered the secret of human suffering, and the way of escape therefrom as well. It was then, in the belief of his followers, that he became "the Buddha," or "Enlightened One," and was fitted for his mission among men. His next thought was, Should he reveal that which at so much pains he had learned? and here for a time his mind remained in suspense. To himself the matter was clear enough, but he felt it was almost impossible that others should receive it; but in the end he decided to make it known, trusting that at least he should be able to find some who would receive it. Filled with this inspiration, he took up his begging bowl and set forth to show to men the way of salvation. His first thought was of his former Brahminical teachers, but he found on inquiry that they were both dead. He then sought out the five disciples with whom he had retired to the jungle, and

finding them still living in the practice of asceticism, in a forest near Benares, he made known to them the change that had passed over himself, and they became his first followers. He then remained with them for a time in the forest, and as the news of his coming spread in the neighbourhood, others resorted to the little company, which gradually increased, until about sixty disciples looked up to him as master. Having instructed these in the doctrines he had formulated he sent them out as missionaries of the new faith, and set out himself upon a similar journey. Henceforward he continued to the end of his life to spend his time in a similar manner. During the rainy season he gathered his disciples together and instructed them, and then sent them forth to teach in their turn. His mission lasted more than forty-five years, and it was attended with amazing success, so that when his death took place, at the age of eighty, the new religion was firmly established in the land. Immediately after his death his disciples assembled in consultation, and as his teaching had been entirely oral, they resolved, while it was fresh in their memories, to reduce it to writing. The first work thus produced appears to have been a record of his sayings, the "Sutras," and this was followed by the "Vinaya" or discipline, and by the "Abhidharma" or philosophy. It is very improbable that these books were all composed at the first council, and it is certain that two other councils were afterwards called to settle the sacred canon, the last of which was held about 250 B.C. There is good reason, however, for believing that these sacred books are substantially identical with those that were agreed upon at this last council, and further that they fairly and even fully embody the teaching of Buddha himself.

The intense enthusiasm he had excited in the minds of his disciples did not subside at his death. On the contrary, their missionary zeal appears to have been intensified by the event, and the result was a rapid increase in the numerical strength of the new religion. In less than a century and a half it had become the chief religion of Northern and Central India. It had been carried to Ceylon long before this, and there it became the state and only religion, while in China its progress was such that it was recognized as the third religion of the state about the year 65 A.D. From Ceylon it spread to Siam and Burma, and its missionaries even crossed the Himalayas, and gained converts among the wild tribes in Central Asia. In the third century of our era an important convert was made in the person of Asoka, king of Magadha, whose rule extended over the whole of Hindustan. By his commands the teachings of Buddha were inscribed on rocks and monumental stones in all parts of his dominions, while monasteries and sacred buildings were erected in immense numbers. But it had now, so far as India was concerned, reached its highest point. Its subsequent history is involved in the deepest obscurity, but it is certain that it gradually declined in power and influence until the Brahminical party were emboldened to persecute it, and this they did so effectually that somewhere about the eleventh century it had disappeared as a religion from the country where it had been first established. It still held its ground, however, in Ceylon, Burma, Siam, China, Japan, Kashmir, Tibet, and Nepal; and in these countries it has remained until the present day.

It is evident from these facts concerning its rise, progress, and endurance, that as a religious system it must have within it something that meets the spiritual needs of men. Yet it is very difficult for a European, whose mind is imbued with the ideas engendered by Christianity, to see where the secret of its marvellous power is to be found. Certainly no clear idea of this can be arrived at, unless the religious condition of India when it first arose is carefully considered, or unless there is borne in mind the notions concerning the universe that are prevalent among those by

whom its teachings are accepted. The former point has already been alluded to in the article *BRAHMANISM*, and it is only necessary here to refer to the fact that this system had become corrupt, and formed, by its elaborate ceremonies and its iron laws of caste, a grievous burden upon the people of India. As Christianity in its origin assumed the form of a protest against the corrupt worship and practice prevailing in the Roman empire, so Buddhism became a force opposing Brahmanism; and being in nearly all respects an immensely superior system, it is not altogether wonderful that it should have made rapid progress. In considering its principles, therefore, they must not in fairness be contrasted with those of Christianity, but rather with those of the Brahmanical system, from which it emerged. It will be necessary to notice in order, first, its intellectual or speculative side, and then its system of morality and practice. We may pass over its fanciful cosmogony and cosmography, merely observing that Buddhists believe in the existence of innumerable worlds scattered throughout space, over each of which there is a series of heavens, and under each of which there is a series of hells. It believes in the existence of gods or glorified beings in the heavens, but it has no trace of any belief in a Supreme Deity, and, singular though it may appear to us, this ancient and widespread religion finds no room for a personal God. It recognizes, however, the existence of a force outside of men and things, which we may term fate, and it is upon this that its foundations are laid. At the time of the founder the belief in transmigration had long been firmly established throughout the East. This doctrine he accepted in its most extreme form, and probably no doubt as to its reality ever occurred to him at all. According to this theory death is only the passing into a new shape, the spirit passing into a new body or other form of existence. What this form is to be will be decided by the accumulated merit or demerit of former lives, and a man may either be born again a glorious being in one of the heavens or in any of the other states of existence down through the scale of life—human, animal, vegetable, or inorganic—to that of the lowest of the gloomy hells under the earth. But under whatever form he may reappear, his stay in it is not permanent but only temporary. It may extend through more ages than can be counted, but sooner or later it will have an end; nor will the circumstance of the attainment of heavenly bliss prevent the being from passing into a future state of misery. There was, in addition, a widespread feeling that this endless chain of existence formed a burden heavy to be borne. Existence in any form seemed to imply unrest and suffering, so that existence and evil seemed to be almost convertible terms. It has been suggested that the causes of this view of life are to be found in the physical organization and social and political condition of the peoples of the East; but whatever may be its cause, it seems certain that a pessimistic theory of existence, which in Europe is only professed by a handful of eccentric philosophers, is quietly accepted as the only possible theory by whole peoples in the East. When these considerations are borne in mind we are enabled to see how the conception of a possible annihilation should be received with joy by Gautama and his followers. To that all-pervading force which caused the continued existence and defined the condition of each individual, the name *Karma* was given, and this he considered to be the sum total of each individual's merit or demerit. If the chain that bound men to life could be broken conscious existence would cease, and the condition of unconsciousness would endure for ever. This passing out of existence forms the Nirvana, which is the ideal state to be aimed at by every devout Buddhist. The founder believed that he had found out the method whereby the chain could be severed, and the so-called four sublime verities, in which these principles are set forth, became the corner-stone of his system. This formula has varied

slightly in wording, though its meaning has been the same everywhere, and it may be translated as follows:—

- I. That misery always accompanies existence.
- II. That all modes of existence result from desire.
- III. In Nirvana all pain and sorrow cease.
- IV. There is a fourfold way leading to Nirvana.

Concerning the last of these principles, the fourfold way is defined as consisting in its first stage of a conception of the evils arising from a separate state of existence and the desire to obtain deliverance from it. The second stage is reached when the enlightened believer has got rid of all lust and feelings of anger or revenge towards others. He has entered the third path who is further free from all evil desires, from ignorance, doubt, wrong belief, and hatred. When this is accomplished the believer has entered upon the fourth path, and by becoming free from the lust of the flesh, the defilements of wrong belief and ignorance, and the desire of existence, he has attained to the possibility of Nirvana. These four paths have again been divided by the Buddhist teachers into eight steps, viz. right faith, right judgment, right speech (truthfulness), right purpose (purity of conduct), right practice (*i.e.* of the requirements of a religious life), right obedience (to Buddhism), right memory, and right meditation. From these principles there was developed a series of practical moral and religious precepts. Fifteen classes of sins have been defined, viz. murder, theft, adultery, untruthfulness, slander, the use of angry and foolish words, covetousness, malice, scepticism, intemperance, gambling, idleness, evil company, and improper amusements. By this system men are divided into three classes—the people of the outer world, the inner circle of the religious, and the innermost circle of the regular ascetics and monks. On the first class five essential commandments are enjoined, viz. not to kill, not to steal, not to lie, not to get drunk, not to commit adultery. The second class, in addition to these, must (1) abstain from food after mid-day, from public amusements, from costly apparel, from luxurious beds, and from gold and silver. For the regular monks there are, in addition to these ten commandments, an elaborate series of lesser restrictions, which, if faithfully observed, would make the practice extremely rigid and austere. Patience, resignation, and humility are enforced upon all men; while, of all the virtues possible to man, the highest place is given to charity, which is extended to include animals as well as men. Of the outpouring of blood as a sacrifice for sin the system of Buddhism knows nothing, and the sinner is exhorted, if he would be freed from his sins, to practice humiliation, repentance, and confession.

The following translation of a poem embodying moral precepts, found in the sacred canon, and ascribed to Buddha, is given by Mr. Rhys Davids in his work on Buddhism, under the title of the "Buddhist Beatitudes":—

In answer to the question, Which is the greatest blessing? Buddha replies—

- Not to serve the foolish,
But to serve the wise;
To honour those worthy of honour;
This is the greatest blessing.
- To dwell in a pleasant land,
To have done good deeds in a former birth,
To have right desires for one's self;
This is the greatest blessing.
- Much insight and education,
Self-control and pleasant speech,
And whatever word is well spoken;
This is the greatest blessing.
- To support father and mother,
To cherish wife and child,
To follow a peaceful calling;
This is the greatest blessing.
- To bestow alms and live righteously,
To give help to kindred,
Deeds which cannot be blamed;
This is the greatest blessing.

To abhor and cease from sin,
To eschew strong drink,
Not to be weary in well-doing;
This is the greatest blessing.

Reverence and lowliness,
Contentment and gratitude.
The hearing of the Law at due seasons;
This is the greatest blessing.

To be long-suffering and meek,
To associate with the members of the Saugha,
Religious talk at due seasons;
This is the greatest blessing.

Temperance and chastity,
A conviction of the four great truths,
The hope of Nirvana;
This is the greatest blessing.

Beneath the stroke of life's changes,
The mind that is unshaken,
Without anguish and pass on, and secure;
This is the greatest blessing.

On every side are invincible
They who do acts like these,
On every side they walk in safety;
And this is the greatest blessing.

If, as seems most probable, the original teaching of Buddha was in substance like the foregoing, it is not wonderful that it was readily accepted by the devout people of India. While the philosophy remained the study of the few, all could appreciate the purity of the morality thus inculcated, and could rejoice in the freedom from the burdensome ritual of Brahmanism, while the heavy burden of caste gave way before the declaration that all the followers of Buddha must renounce its restrictions. Unhappily, in the East as elsewhere, the ideal of the founder and his teachings, as given in the sacred books, proved too high for general acceptance. As in Judaism and in Christianity, many corruptions gradually crept in, defiling both belief and practice. Wild fantastic legends concerning the Buddha took the place of his high moral teaching, and the mendicants, who were to have been ascetics, poor and humble, became too often idle, wealthy, and overbearing. The practice of the virtues Buddha had enjoined was found less easy than the adoration of his so-called relics; statues of him were erected everywhere, and prayer, with singing and ritual, was offered before them. Thus, in course of time, the original system has become almost lost amidst a mass of superstition and folly, and it is most likely that it was owing to the corruption of Buddhism that Brahmanism was enabled to regain its ascendancy in India. The sacred writings, however, are still cherished, preserved, and read to the people by the monks. These sacred writings form a very extensive collection of literature. The first three sacred books contain above 592,000 stanzas, while the commentaries extend to 361,550 more. Like the Bible the letters of the Buddhist sacred canon have been counted, and they are given as 29,368,000, or nearly six times as many as those of the Bible.

The numerous Buddhist temples of India must be referred to a period some long time before the eleventh century. These remains it is not difficult to distinguish from others in their immediate neighbourhood erected for the purposes of Brahmanical worship. The principal characteristics of temples built for the Buddhists are the dagobas and the images of Buddha. The dagoba is a hemispherical or sometimes pyramidal structure containing some relic of Buddha, which usually stands either within or (as in Ceylon, Siam, &c.) close by a Buddhist temple, and is supported by a pedestal, generally of a cylindrical shape, which varies in height. All images of Buddha represent merely human figures in a contemplative posture, sometimes standing upright or reclining, but more frequently sitting on a bench, or squatted down with the feet crossed and resting upon the thighs; the fore-finger of the right hand sometimes rests on one of the fingers of the left, but usually the

left hand rests upon the left knee, and the right hand is placed on the lap, being held open, as if to receive an offering. The hair is always curled almost in the fashion of a wig, and the ears are extended and drawn down as if by the weight of some ornament suspended at them.

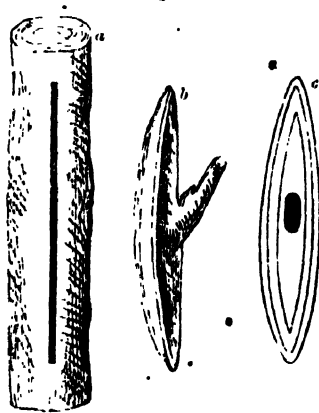
Ruins distinguished by these peculiarities have been found near Benares, at Buddha Gaya in Bengal, at Bag in Malwa, near the Ajunta Pass, at Ellora, at Nasik, at Juner, at Carli, on Salsette, and at Guntoor. Those of Boto Burpout (or Bura Booder), in Java, prove undeniably that Buddhism once prevailed in the very centre of that island. The simultaneous occurrence of traces of Brahmanic and of Buddhist worship in several of these places serves to attest the friendly spirit that once prevailed between the two religions.

The Buddhist priests are dressed in robes of yellow cloth, have their heads shaven, go barefooted and bareheaded, live in monasteries, and perform regular daily services in their temples; they are also sworn to poverty and celibacy, and subsist upon alms. At one time nunneries for women appear to have existed, but none are to be met with now.

Upon Buddhism generally the following works may be consulted:—Eugène Burnouf's "Introduction à l'Histoire du Bouddhisme Indien" (Paris, 1844); the Rev. Spence Hardy's "Eastern Monachism" (1850), "Manual of Buddhism" (1860), and "Legends and Theories of the Buddhists" (1866); Bishop Bigandet's "Legend of Gaudama from the Burmese" (1858, 2nd edition 1866); Barthélemy St. Hilaire's "Le Bouddha et sa Religion" (Paris, 1860); Wassilief's "Der Buddhismus, seine Dogmen und Literatur" (1860); the Rev. S. Beal's "Catena of Buddhist Scriptures from the Chinese" (1871), and "Romantic History of Sakya Buddha from the Chinese Sanskrit" (1875); and "Buddhism," by Rhys David (1881), and "Buddha," by Dr. Oldenberg (Eug. trans. 1883). Among works dealing with Buddhist writings are Rogers' "Buddhaghosha's Parables," with an introduction by Professor F. Max Müller (1870); Sir M. C. Swamy's "Sutta Nipata"; Emile Senart's "Le Mahāvastu"; and the valuable series of translations of the "Sacred Books of the East," published under the editorship of Professor F. Max Müller.

BUD'DING, an operation in horticulture, by means of which the branches of one kind of plant are often made to grow upon the stem of another kind. The bud has the

Fig. 1.

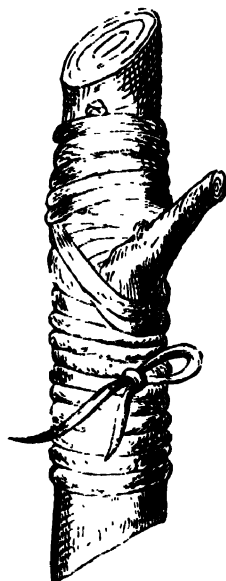


power of growing when separated from the mother plant. Not only will it grow, but it will emit roots, form a stem, and become in time a new individual in all respects similar to its parent, retaining all the special peculiarities of the latter. In this respect it differs from a seed, which in general is not capable of doing more than propagating a species without any power of preserving, unless accidentally, the peculiarities of the individual from which it sprang.

Gardeners have availed themselves of this property in leaf-buds for the purpose of artificial propagation, either by planting the separated buds in earth or by introducing them into the branches of other plants. The former is called propagation by eyes; the latter only is technically named budding.

Budding is generally effected thus:—A smooth part on the northward side of the stock, away from the sun, is chosen for the insertion of the buds. This should be done by making a horizontal cut across the rind of the stock, and from the middle of that a slit downwards about 2 inches in length, so that it may have the form of the letter T, being careful not to cut too deep lest the stock should be wounded;

Fig. 2.



then having cut off the leaf from the bud, leaving the foot-stalks remaining, a cross-cut should be made about half an inch below the eye, and the bud slit off, with part of the wood to it, somewhat in the form of an escutcheon or shield; and hence it is called *shield-budding*. Fig. 1 is an illustration of this mode of budding. The stock, *a*, has only the longitudinal slit, and this is preferable, though it is more difficult to insert the bud; *b* is the scion cut from the shoot; *c* is the scion with the woody portion extracted and the eye retained. Fig. 2 shows the bud inserted into the branch of the tree, and the way in which it should be secured by the ligature of matting or other tying material to be used. In the following spring the stock is cut off about 3 inches above the bud.

There are several other modes of budding, such as *reversed budding* and *scallop budding*, which are occasionally practised,

but the mode described here is the best. Roses, plums, peaches, nectarines, cherries, and many other plants, are chiefly propagated thus, and there is no theoretical reason why it should not be extended to all species. In practice, however, it is occasionally found impracticable, as in heaths, in vines, &c., owing to specific causes which vary in different instances.

Budding is usually performed in the months of July and August, because at that season the bark separates freely from the wood, and the young buds are fully formed; but whenever the two latter conditions can be satisfied, the operation may take place equally well. It must, however, be observed that the bud of one plant can only be made to grow upon the wood of another when both bud and stock are nearly related botanically. Thus roses will bud upon roses, but not upon currants, as is vulgarly supposed; apples will bud upon pears or thorns; pears upon medlars or quinces, and apricots upon plums, because all these species are closely related; but an apple will not bud upon a plum or a peach, because, although they are allied to a certain degree, yet their affinity is not sufficiently close.

BUDE LIGHT, a brilliant flame for illuminating purposes, so called from the name of the home of the inventor, Mr. Gurney, who resided at Bude, Cornwall. It consists of the introduction of a current of oxygen into the centre of the circular flame of an argand burner. Originally it was designed for the flame of an oil-lamp, afterwards oil-gas was substituted for the liquid oil, and lastly coal-gas was utilized for the purpose. The beautiful light of the

House of Commons is produced by means of a number of Bude lights shining through a screen of ground glass.

BUDGET (Fr. *bougette*, Ital. *bolgetta*), a small bag or wallet with its contents, but more commonly used as a term to express any compact collection of things. Hence a favourite old term for what we call a "miscellany," was "a *budget* of inventions." So the yearly scheme of finance of a minister consists of a *budget* of plans; and thus "The Budget" in English is always used as the designation for the annual financial statement which the chancellor of the Exchequer, or sometimes the first lord of the Treasury, makes in the House of Commons, in a committee of ways and means. The minister gives a view of the general financial policy of the government, and shows the condition of the country in respect to its industrial interests. This is of course the time to present an estimate of the probable income and expenditure for the twelve months ending the 5th of April in the following year; and to state what taxes it is intended to reduce or abolish, and what new ones to impose; and this is accompanied with the reasons for adopting the course which the government proposes. The chancellor of the Exchequer concludes by proposing resolutions for the adoption of the committee. These resolutions, when afterwards reported to the House, form the groundwork of bills for accomplishing the financial objects proposed by the minister. Resolutions for the increase of duties generally take place immediately after the passing thereof, being subsequently confirmed by Act of Parliament.

BUDWEIS, the capital of the circle of Budweis, in Bohemia, is situated close to the confluence of the Moldau and Malsch, 78 miles by railway N.N.E. from Linz. It is a well and regularly built town; is the seat of a bishop; has a cathedral, seven churches, a gymnasium, a philosophical academy, a theological seminary, and contains 18,000 inhabitants. The town manufactures woollens, saltpetre, &c., and has a large transit trade. The Bohemian name for Budweis is Crske Budezovice. It was founded by Ottocar II. in 1256, and has twice suffered capture in war. The first railway constructed in Germany was that for horse cars from Budweis to Linz in 1827. Above the town on the N. rises the beautiful new Gothic chateau of Frauenburg, the property of Prince Schwarzenberg.

BUEÑOS AYRES, the largest and most populous of the states of the Argentine Republic, has a coast-line along the Rio de la Plata and the Atlantic above 900 miles in length. It is bounded on the N. by the Parana, separating it from the province of Entre Rios, and by the provinces of Santa Fé, Cordova, and San Luis; on the E. by the Atlantic, on the S. by Patagonia, and on the S. and W. by the country of the Indians, which extends to the Andes. The area is 63,000 square miles, and the population 195,000. The north part of it is a wide monotonous plain, rising so gradually as to reach 100 miles inland, the height of only 200 feet, but gaining an altitude of over 2000 feet near the Andes. The S. part is, however, less uniform than the middle and northern; the surface rises into low hills and cliffs; and ridges of crystalline rocks, granite, quartz, gneiss, clay-slate, &c., break out from under the underlying tertiary formation, like rocky islands from the sea, upon two parallel axes, trending N.W. and S.E., through several hundred miles, and attaining, in the Sierra Ventana, N. of Bahia Blanca, the altitude of 3350 feet. The N. ridges, running N.W. from Cape Corrientes, bear the names of Sierra Vulcan, Tinta, Tandil, and Tapalquen, and are 150 miles long, but do not pass 500 to 600 feet; the southern, trending parallel from Bahia Blanca, are called Sierra Ventana and Guitru-gueyu; they are 200 to 250 miles long, and reach in some parts the height above stated. The plain, at their bases, is 840 feet above the sea; and the singular pampean formation, with its usual mineral character and gigantic fossil remains, covers

close up, in horizontal stratification, to the base of the mountains. On the N.W. side of the ranges are the great Salinas, which supply salt to the capital. Fine crops are raised in the eastern districts, and wheat is exported; but the chief source of wealth is in the cattle and their produce; they range in a wild state over the vast plains in countless numbers, and are destroyed for the sake of their hides, fat, hair, bones, and horns, the flesh being generally thrown away. Horses, mules, asses, and sheep are also reared, and of late wool has been exported. There are great facilities for intercourse with the western districts and with Chili, by a railway which connects the capital to Valparaiso, crossing the Andes at the Planchon Pass, 8225 feet high. W. of Mendoza, with branch lines to other principal places in the republic. The climate is dry, but variable, and though there is sufficient rain in general throughout the province, occasionally there are years of excessive and destructive droughts. Formerly the cultivation of the soil was so neglected that grain was required from abroad, as the natives considered any occupation that could not be carried on on horseback degrading. The country is very deficient in harbours. A chain of forts has been established along its W. boundary to overawe the Indian population.

BUENOS AYRES, the capital of the Argentine Confederation in South America, is situated on the south bank of the latter part of the wide estuary of the La Plata River, about 150 miles from the place where it enters the sea. Though this estuary (20 miles wide) has a considerable depth in the middle, it grows very shallow towards its south bank. The city stands on high ground, and extends about 3 miles along the river, with a beach or flat ground between it and the water. There is a pier for landing passengers and another for goods (which have to be unshipped to lighters), connected by a tramway with the custom-house. Behind the custom-house are the two principal squares, one of which is planted with trees and contains the cathedral, bishop's palace, police office, and the cabildo or town hall, in which are the law offices and the prison. The streets are wide, and cross each other at right angles at every 150 yards, dividing the town into a number of squares, each having an area of about 4 acres. They are mostly paved with granite, and have generally a shop as cut from the street, which gives the town a very imposing appearance from the water. Nearly all the better class of houses have two stories. They are built of brick, plastered and white-washed, and have flat roofs. The city is lighted with gas, and is the terminus of four railways leading to different parts of the interior. It is also telegraphic communication with all the principal places of the republic and with Europe. The city has been irrigated and the water supply considerably extended in recent years. There is probably no part of the world, except a British colony, in which so much British capital has been invested, as in Buenos Ayres and its neighbourhood.

There are about sixteen Roman Catholic churches, the chief being the cathedral, which is a very large edifice, and splendidly decorated internally; externally it has rather a gloomy appearance. There are also British Episcopal, Scotch Presbyterian, Geneva Lutheran, and American Methodist churches. The places of amusement include three theatres—two of them being as large as Covent Garden, London. The educational and scientific institutions are numerous; they comprise a university, a public library, a museum of natural history, an observatory, schools of mathematics and of the fine arts, a natural philosophy society, and children's schools. The principal manufactures are cigars, carpets, furniture, and boots and shoes.

The exports are valued at about £10,000,000 per annum, and consist chiefly of hides, horse-hair, tallow, wool, jerked beef, and extract of meat. The imports are valued at about £7,000,000—more than one-half of which consists of goods from England, chiefly cotton and linen manufac-

tures. There are several lines of steamers to Europe and one to the United States. The commerce of the town would doubtless have increased even more than it has, were it not that large vessels drawing above 12 feet of water cannot come nearer than 5 or 6 miles; vessels of less draught generally go into the inner roads, and anchor about 1½ mile from the city. The surf on the beach is very heavy when the wind blows from the S.E.; another danger arises from the pumpers, sudden and violent gusts of wind which sweep across the pampas from the Andes with tremendous fury. There is a harbour for coasting vessels on the S. of the city, in a small river called the Riachuelo.

The population amounts to about 300,000, of whom more than one fourth are of Spanish or other European descent. The town was founded by the Spaniards in 1535, but they were not firmly located there till 1580. In 1620 the city was erected into a bishopric, and in 1700 contained 16,000 inhabitants. In 1776 it became the seat of the vice-royalty of La Plata; and in 1778, when the trade of the river was thrown open by Spain, its trade and consequence began rapidly to augment.

In 1805, and again in 1807, it was invaded by the English, who were repulsed by the inhabitants on both occasions unaided, for an application to the authorities in Spain for help met with no success. These victories encouraged it to throw off the yoke of Spain, which it did at the revolution of 1816. Buenos Ayres now became the capital of the new republic, but, obtaining an exclusive influence over the government, the other provinces grew discontented, and a civil war took place, which continued with various intervals until the establishment of the Argentine Republic in 1861.

The name Buenos Ayres signifies "good air," and was given to the city by its founders on account of the salubrity of its climate. A great disadvantage of the city is that its immediate territory is almost entirely destitute of timber and wood.

BUETTNERIA, a group of plants, placed by Benth and Hooker as a tribe of STERCULIACEÆ. The species are chiefly inhabitants of tropical countries; their bark often yields a tough fibre fit for manufacture into cordage; and one species, *Theobroma cacao*, produces the seeds from which cocoa and chocolate are obtained.

The flowers have both stamens and pistil; the petals are concave or hood-shaped. The filaments of the stamens form a tube, with lobes (abortive anthers) opposite the sepals, and fertile anthers between these lobes. The genus Buettneria is very widely distributed, being found in the East Indies, Madagascar, and tropical America. The greater number of its species are prickly bushes, climbing over trees. A tolerably good cordage is made from the fibres of the bark of species of *Abroma*. See *GRAZUNA* and *PILOMOMA*.

BUFFALO, a city and port of entry in the state of New York, North America, is situated on the outlet of Lake Erie, at the head of Niagara River, on Buffalo Creek, which forms its harbour. It is 22 miles S.E. from the Niagara Falls, and almost equidistant from New York and Montreal, being 133 miles N.W. of the former and 127 S.W. of the latter. The climate is more equable than that of any other American city of the same latitude. The city extends from some low ground to a high plateau, and its general aspect, from the great breadth and cleanliness of the streets, and from the rows of trees which usually line them, is both handsome and pleasing. There are numerous places of worship and educational establishments, some of them handsome and elegant structures; but the chief public building is the post office, custom-house, and United States district courts, which are all under one roof. There are also a theatre, orphan asylum, university and lyceum, and numerous banks and insurance offices, several of them being handsome buildings. The water supply is brought

from the Niagara River, and is of excellent quality. There are extensive manufactures of iron and woollens, rolling-mills, foundries, saw-mills, and shipbuilding. It is, however, to its commerce that Buffalo owes its present position, and its growth has been exceedingly rapid. In 1825 it was a scattered village of about 2000 inhabitants; its population in 1883 was 160,000, and altogether it is one of the most thriving cities in the Union.

The harbour is spacious and safe. It has a pier of wood and stone 1500 feet long, which operates as a breakwater, keeps the channel clear, and enables vessels drawing 11 feet of water to pass freely. There are a large number of steam vessels, schooners, and other craft, which navigate Lake Erie and the connected lakes, engaged in the commerce between Buffalo and the western states. The value of the imports from all parts is estimated at 300,000,000 dollars per annum, a large part of which is for grain and flour. It is no uncommon occurrence for 200 vessels and steamers to arrive from the West in twenty-four hours. In 1873 an International Bridge was completed over the Niagara River at Buffalo, and trains now run to and fro between the United States and Canada without change of cars. The bridge is in three divisions, and its total length is 8651 feet. Near the eastern shore, a swing bridge—the largest of the kind in the world—turns upon a pivot pier, leaving two open spaces, each 180 feet wide, for the passage of masted vessels.

Buffalo is now divided into thirteen wards, and is governed by a mayor and twenty-six aldermen. It was founded in 1801, and was an inconsiderable place previously to 1812, in which year it was made a military station. Its destruction in 1811 was effected by a party of British and Indians.

BUFFALO (*Bubalus*) is a genus of RUMINANTS belonging to the family BOVIDÆ.

The Common Buffalo (*Bubalus bubalis*) is a native of India, whence in a domestic or rather semidomestic state, and valued as a beast of draught and burden, it has spread throughout Siam, Cochin-China, China, Malacca, Borneo, Java, and Sumatra. Westward, it has been carried into Persia, the Crimea, Turkey, Greece, Spain, and Italy. In



Buffalo (*Bubalus bubalis*).

Sumatra the buffalo exists in a wild as well as a reclaimed state, and wild buffaloes are common in the forests of Abyssinia, whence they are hunted, their thick hide being used for the manufacture of shields.

The buffalo is a huge animal, standing nearly 6 feet high at the shoulders, and measuring 10½ feet from the extremity of the muzzle to the root of the tail. In a wild state it is called the *Arna*. The wild buffalo lives in large herds, and inhabits the marshy swamps and low grounds in the immediate neighbourhood of large forests. It is readily recognized by the uniform shortness of the tail; by the tufts of hair

which protect the forehead and knees; and chiefly by the enormously developed horns, which are particularly long and directed backwards in one variety, and much curved and spread out laterally in another.

In its wild state it proves a most terrible opponent, not only to the elephant, but to the tiger also. One of the principal sources of entertainment given by the native princes of India has ever consisted in affording a display of



Cape Buffalo (*Bubalus capensis*).

the cruel ferocity of the tiger and the buffalo, and in these fights the buffalo usually comes off victor. In India the buffalo, when tamed, is often used for sporting purposes. "A bell," says Tennent, "is attached to its neck, and a box or basket with one side open is securely strapped on its back. This at night is lighted with flambœux of wax, and the buffalo bearing it is slowly driven into the jungle. The huntsmen with their fowling-pieces keep close under the darkened side, and as it moves slowly onwards the wild animals, startled by the sound and bewildered by the light, steal cautiously towards it in stupefied fascination. Even the snake, I am assured, will be attracted by this extraordinary object; and the leopard, too, falls a victim to curiosity." As a beast of burden the tame buffalo possesses numerous advantages over the horse, being able to traverse muddy swamps 2 or 3 feet in depth with comparative facility. This animal is also much valued for its strong leathery hide, but as a source of food it is much inferior to ordinary cattle.

The Cape Buffalo (*Bubalus capensis*) is a native of South Africa, where it is known by several other names, such as the Cape Ox, the Buebe, and the Bokobokolo, the latter title being that employed by the Bechuanas. It occurs in large herds in the plains and forests of the interior. It is an extremely heavy and powerfully built species, a full-grown specimen weighing as much as 45 stone or upwards. The body is, in some individuals, nearly 9 feet in length, exclusive of the tail, which is 3 feet long, terminating in a tuft of coarse black hair, reaching below the hocks. The fur exhibits a brown-black colour. The horns are massive, very broad at the base, where they closely approximate, spreading thence horizontally they turn upwards and inwards, at the tips, which are separated from each other by an interval of about 1 foot. These animals are regarded as most formidable antagonists. Their ferocity when wounded is perfectly frightful. The herds are usually found grazing in the immediate vicinity of some large wood, in numbers varying from twenty or thirty up to at least 500.

The Cape buffalo is replaced north of the equator by a smaller variety with shorter horns. The *AXOA*, peculiar to the island of Celebes, presents a striking resemblance to the young of the Cape buffalo.

The American Bison is sometimes called buffalo.

BUFFET, a French name for sideboard. It is now, however, most commonly used for those large counters, spread with refreshments, which are found at railway stations, &c. The corps of the king's attendants of

the Buffet, the *Buffetiers*, are well known under the modern corruption of their name as "Beef-eaters." They still wear their antique dress at the Tower of London and on important state occasions.

BUFFON, GEORGE LOUIS LE CLERC, COMTE DE, a famous French naturalist and physicist, son of Benjamin Le Clerc Buffon, a councillor of Parliament, was born at Montbard, in Burgundy, on the 7th of September, 1707, a year which was also marked by the entrance of Linnaeus into life. Buffon first entered the Jesuit's College at Dijon as a student of law, but in preference devoted himself to astronomy and mathematics. Subsequently he travelled through Italy with his tutor and with Lord Kingston, and during this journey his mother died, leaving him in possession of an ample fortune. It was not until he had attained the age of twenty-five that he settled upon his estate, where in retirement he resolutely pursued his studies, occupying during his hours of labour a pavilion at the extremity of his garden, remote from disturbance. At this time he engaged in many elaborate experiments, in order to test the truth of the account respecting the destruction of the Roman fleet under Marcellus, by Archimedes, who used burning mirrors for that purpose. After several trials, and not without considerable expense, he constructed mirrors composed of several distinct pieces, by means of which, the sun being propitious, he was enabled to ignite planks of beech and fir at a considerable distance, varying from 66 feet to 250. These experiments led him to others relative to burning-glasses, one of which, having a diameter of 16 inches, and considered as the most powerful in Europe, he presented to the King of France. While engaged in these pursuits he was appointed (in 1739), at the age of thirty-two, to succeed M. Dufay as superintendent of the Royal Garden and Museum, and began to devote his attention to Zoology and the theory of the earth. Among the eminent men associated with him may be mentioned Daubenton and Lape  de.

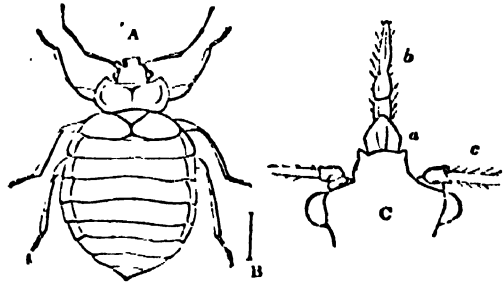
In 1762 he married Mademoiselle de Saint Belin; and in 1776 Louis XVI. created him a count, and invited him to Fontainebleau, with a view of inducing him to accept the office of administrator of the forests, which, however, he declined. Engaged in his studies, and employed upon his works, Buffon passed his time tranquilly until about his seventy-third year, when that torturing malady, the stone, began to render existence painful. He refused to submit to any operation, and lived to the age of eighty-one, dying on the 16th of April, 1788.

His body was embalmed, and placed in the same vault with that of his wife at Montbard. The respect paid to his memory by the learned of France was very great, and it is said that 20,000 people congregated to see his funeral. Buffon left a son, whose abilities were considerable. He rose to the rank of major in the regiment of Angoumois; but his career was cut short, for he perished by the guillotine during the terrible period of the Revolution. Nor was this all; the bones of his parents were torn from the grave, the lead plundered, and the monument razed to the ground.

In person Buffon was noble and commanding, and his fondness for magnificence and dress amounted almost to a passion. At the same time he was roused by a fervent desire for knowledge and a boundless appetite for study. His works were numerous, and have obtained for him that immortality which he is said to have so much desired. His translations of Hales' "Vegetable Statics," and of Newton's "Fluxions," both of which he prefaced with great ability, appear to have been undertaken with a view of improving his style as well as of advancing his knowledge. The "Memoirs of the Royal Academy," of which he was so distinguished a member, contain many of his papers. His largest and most important work was the "Histoire Naturelle," Of the 4to editions, the first (on thirty-six vols., printed at the royal press) appeared in 1749, and was in course of publi-

cation down to 1788; another was published in 1744 and the following years, in twenty-eight vols.; but this is comparatively of less value, for, though it contains the supplementary matter, Daubenton's Anatomy is cut out, and the plates are considered as worn and bad. Of the supplement, six vols. appeared in Buffon's lifetime. The seventh was published in 1789, by Lac  p  de, after Buffon's death. In the department of Birds, Buffon was assisted by M. Gueneau de Montbeillard, Baillon, and the Abb   Bexon. There are five vols. on Minerals; a history of vegetables was also contemplated. The magnificence of the "planches enlumin  es" is well known to every collector.

BUG is the general name applied to INSECTS of the order HEMIPTERA and section HETEROPTERA. The common bug is the bed bug (*Cimex lectularius*), a little insect whose circle of acquaintances is by no means confined to entomologists. The body is very flat and roundish in form. The wings are quite rudimentary, the hind pair being altogether absent, and the only indications of the front pair being two little scale-like appendages situated just



A. Common Bug (*Cimex lectularius*), magnified; B. natural length of do.; C. head of do. highly magnified; a, the labrum; b, the proboscis; c, base of the antennae.

behind the prothorax. The antennae are four-jointed, the two terminal joints being extremely slender. The mouth is furnished with a three-jointed proboscis, which, when not engaged in sucking blood, lies along the under side of the thorax. The upper lip (*labrum*) is rather long and pointed. The body emits an offensive odour when touched. The habits of this interesting little animal are already sufficiently familiar.

The female bug deposits her eggs in the beginning of summer; they are of a tolerable size compared with that of the insect, of a whitish colour, and each fixed to a small hair-like stalk, which, when the egg is first deposited, is apparently of a glutinous nature, and readily adheres to anything which it touches.

The bed bug was formerly a rare insect in this country. It is often asserted that they were unknown in England before the great fire of London in 1666, when they were introduced in timber imported from America for rebuilding the city. This is, however, a mistake, for their occurrence in England is mentioned in 1503. In Greece and Italy, at all events, at an early period they were sufficiently well known to earn recognition from the pens of Aristophanes and Martial.

BUG. See VISTULA.

BUGLE, a small horn of brass or copper. The word comes from old French *bugle*, a wild ox (Lat. *buculus*, dim. of *bov*), and is short for bugle-horn, being a trumpet made at first from the curling horn of the animal, and afterwards imitated in metal. The bugle is shorter than the trumpet, and its bore expands much more rapidly. Its performance is limited to eight sounds (the first eight of the harmonic series), of which only about five are used. Its office is to sound the infantry military signals, corresponding to the trumpet-calls of the cavalry. It has been sought to be made

useful in general music by being fitted with keys, so as to increase the number of possible sounds, and key-bugles were very popular in the earlier part of the century. They are, however, now quite superseded by the CORNET and other instruments, whilst the original military bugle still fulfils its function. The bugle is generally tuned in C; some kinds, however, are in E \flat . All have a crook to lengthen the tubes, so that the sounds are lowered by two semitones—to B \flat and D \flat respectively. The fundamental tone of bugles lies in the bass stave; the octave of this, however, is the lowest note in actual use. See HARMONICS, PARTIAL TONES.

BUILDING may be regarded as the art of constructing edifices, as distinguished from ARCHITECTURE, the art which relates to their design. In the practice of civil architecture the builder is the individual who comes between the architect who designs and the artisans who execute the work; or, commercially, between the party by whom the capital is provided on the one hand, and the merchants and manufacturers who provide the necessary materials, and the workmen whose office it is to shape and unite them, on the other.

Referring to such articles as HOUSE, FOUNDATION, BRICKWORK, and SCAFFOLDING, for general information, and to such as CARPENTRY, ROOF, FLOOR, JOINERY, PLASTERING, &c., for further details respecting various matters relating to the builder's art, we shall here notice very little beyond what relates to the erection of the walls or mere carcass of a building.

The article BRICKWORK relates simply to the modes of arranging the separate bricks or component parts into a solid and adhesive wall or mass of brickwork. The builder must further combine the several portions of a wall broken or separated by openings for doorways and windows, and the several walls of a house, into a self-sustaining structure, every part of which should, as far as possible, lend support to every other part. The effect of openings, for example, must be counteracted by *inverts* or *inverted arches* beneath them, and *discharging arches* over them, these being either left visible or concealed by a facing of other brickwork, according to circumstances. *Wood bricks*, or blocks of seasoned wood, must be inserted in the walls to facilitate the fixing of door and window frames, or other woodwork. *Lintels*, or bars of wood surmounting square-headed apertures, are sometimes used in lieu of arches, but should always be surmounted by discharging arches. *Timber plates* are pieces of wood, larger than wood bricks, inserted to support and distribute the pressure of the ends of beams, &c.; and *wall plates* are still longer pieces let into the brickwork to support the floor-timbers. *Bond timbers* are sometimes inserted to distribute and equalize strain; but the liability of timber to shrink and swell, to rot and to be destroyed by fire, renders it desirable to insert it in brickwork as little as possible, and that under such circumstances that its total destruction may not affect the stability of the walls.

In the erection of any building it is desirable to carry up all the walls as equally as possible, to avoid the risk of unequal settlement. Interior partition walls are often formed of lath and plaster on a timber framing; but where weight is not an objection, of *brick-nogging*, or brickwork 4 or 3 inches thick, strengthened by timber framing. Some use half-brick walls built in cement, and strengthened with iron hooping laid in a few of the joints. The tops of brick walls are protected by CORNICE, which should be so formed as to throw off water.

Other modes of building than with brick are noticed elsewhere. [See MASONRY.] *Flints* and *earth* are also advantageously employed in certain districts. Buildings of flint depend much for their strength upon the quality of the mortar or cement employed, and upon the judicious introduction of bonding-courses and quoins or angles of brick or of larger stone. Building with compressed earth,

or building *en pisé*, is a very cheap mode, long used in some parts of France, but less known in this country than it deserves to be. The mode of executing the work, and the apparatus necessary, are fully described in the *Transactions* of the Society of Arts (vol. xxvii. p. 185-196). For modes of constructing FIRE-PROOF BUILDINGS see that article.

Iron is now used in building operations to an extent far greater than in former years, but some accidents to which its use has given rise drew public attention very forcibly to the danger attending its too liberal introduction into our buildings. Invaluable as it is when properly handled, iron is a very treacherous material when left to follow its own course without constant and competent inspection. It is often carefully embedded in the mortar of a building without the slightest suspicion of the fact that from the moment of its being so embedded it commences a slow but irresistible process that must result, unless provision be made to prevent it, in the destruction of the building it was intended to strengthen. Instances are familiar to the engineer of the splitting and bursting of brick walls from the rusting of hoop-iron between the courses of bricks, which are inserted for the purpose of strengthening the bond. If the bricks had been laid in Roman cement no mischief would have ensued, as this material, when set effectually, prevents that chemical action which lime mortar invariably occasions. The magnificent tomb of Henry VII. in Westminster Abbey was nearly overturned not long since by some iron-work in the structure having accumulated dense plates of rust three or four times its own thickness. In case of fire, too, iron is peculiarly dangerous. The massive beams of oak, scarcely squared, and hewn from whole trees, which formed the staircases, the roof-beams, and the other principal wooden portions of the great mansions of Tudor times, were and are to this day all but incombustible, both by their bulk and by their position; whereas cast-iron, when heated and suddenly chilled—as when the jet of a fire-engine is turned on a burning house—cracks like glass, and many buildings have been thus entirely demolished by partial fires, which would have done comparatively little damage if masonry or solid massive timbering had been used instead of iron; and even if ultimately destroyed, wood gives warning of the coming danger, which cast-iron, in such cases as we refer to, never does. Thus on the one hand from water, on the other hand from fire, iron causes and suffers great peril and danger when employed as a building material.

Where iron is needful it will always be used. What concerns the public safety is that it should not be used by persons ignorant or negligent of its essential character and inherent danger, and that wherever employed as a structural material it should never be left for twelve months without careful and competent inspection.

BUILDING ACTS FOR REGULATING. Provisions for regulating the construction of buildings are generally introduced into Acts for the improvement of towns. There is no general measure insuring uniformity of regulations for buildings throughout the country. London has had Building Acts ever since the reign of Queen Anne; but this object was chiefly to enforce regulations calculated to check the spread of fire. The objects of the Metropolitan Buildings Act, 1844 (7 & 8 Viet. c. 84), may be gathered from the preamble, which declares, among other things, that it is expedient to improve the drainage; to secure sufficient width of streets and other ways, both for the purposes of ventilation and to prevent fire; to prevent the use of buildings as dwellings which are unfit for that purpose; to provide that works in which materials of an explosive or inflammable kind are used shall be carried on in proper buildings and situations; to render works of a noisome kind, or in which deleterious materials are used or deleterious products created, as little noisome or deleterious as possible to the inhabitants of the neighbourhood,

or to provide for the carrying on of such noisome and unwholesome businesses at safer distances from other buildings used for habitation; to make further provision for regulating the office of surveyor of the several districts, and to provide for the appointment of officers to superintend the execution of this Act throughout all the districts to which it is to apply, and for the purpose of consolidating the provisions of the law relating to the construction and the use of buildings in the metropolis and its neighbourhood.

This Act, however, was amended, and its provisions extended, by the Metropolitan Buildings Act, 1855, which repeals the previous Acts. It regulates the strength and construction of dwellings, the dimensions and requirements of habitable rooms and cellars, and is made applicable to all places within the limits defined by the Metropolitan Local Management Act, 1855, and places the surveyors and other officers appointed to enforce its provisions under the supervision of the Metropolitan Board of Works, who are empowered to compel the repair or removal of dangerous buildings. Both of these Acts were further amended by the 41 & 42 Vict. c. 62.

The construction and drainage of buildings are also affected by the Public Health Acts, and these, so far as recent years are concerned, will be found described under SANITARY LEGISLATION. An Act of 1848 provides that no new house shall be built without a sufficient drain, and the construction of necessary conveniences in all houses is made compulsory.

The Act of 1858 (21 & 22 Vict. c. 98), incorporated with the previous Act, provides that the Local Board of Health may, when a house or building is pulled down, prescribe the line in which such house is to be rebuilt, subject to the payment of a fair and just compensation to the owner for the loss incurred by the appropriation of his land, &c.

BUILDING SOCIETIES are associations formed among the working classes, on the principle of benefit societies, with the view of acquiring houses. Any member wishing to become proprietor of a house advances with it either for a building grant, according to a plan agreed on, or for a grant to purchase a house already built. This is paid back by instalments, and at the end of a few years the property becomes his own. When a working man enters at once on the possession of the house, he saves the amount of rent he had been paying to a landlord—his periodical payments to the society being only a little more than what he would have had to pay as rent. In the best organized societies a provision is made for suspending payments in times of sickness or want of work. A terminating building society is one which, by its rules, is to terminate at a fixed date, or when a certain result is attained; at a permanent society is one which has not a fixed date or specified result.

In 1874 an Act was passed to consolidate and amend the law relating to building societies, which now have to be registered by the registrar of friendly societies. The liability of any member in respect of any share upon which no dividend has been made is limited to the amount actually paid on such share; and in respect of any share upon which dividend has been made, to the amount payable thereon under any mortgage or other security, or under the rules of the society. There are several sections in the Act relating to the registration and alteration of rules. Officers are to give accounts and to account for and invest surplus funds, and annual accounts are to be rendered.

BUILDING STONES are obtained from rocks of almost every geological age, their quality being largely dependent on their composition and the amount of alteration or metamorphism they have undergone. In addition to strength, which in this case means resistance to pressure, it is essential that they should not be friable nor liable to disintegrate on exposure to the weather; they should also be capable of resisting sudden changes of temperature, and

the effects of both fresh and salt water, without alteration. Compact fine-grained stones, free from substances liable to decomposition (as pyrites, &c.), are therefore best; they should not, however, be too hard, as then the cost of quarrying and dressing becomes excessive. Some stones, when first quarried, are quite soft and easily dressed, but on exposure they lose their "quarry water" and harden. Where possible it is well to observe the weathering which the surface of the rock undergoes at the quarry, as this gives a clue to its probable duration. In the absence of much iron, the specific gravity is a fair relative guide as to quality; the stone should also be tested as to its porosity by the amount of water it absorbs.

It would be impossible in a short space to mention the various stones used for building purposes; we shall therefore only refer to the more important used in this country, and more detailed descriptions of them will be found under their respective heads. They may be roughly and conveniently classified according to their predominating chemical constituent, as silicious, argillaceous, and calcareous stones.

Silicious Stones may be of sedimentary, metamorphic, or igneous origin, the latter two varieties being usually more or less crystalline, and affording the best and most durable building stones; however, their hardness limits their use in many instances. *Syenite* and *Granite* are the most familiar varieties, and for an example of the durability of the former we may refer to Cleopatra's Needle. Both varieties are much used when polished for ornamental pillars and pedestals; where plentiful they are used for general building purposes, as in Aberdeen. Of the granites employed in this country the following are some of the most familiar varieties:—Aberdeen granite is generally of a grayish colour, but that quarried at Peterhead is of a reddish tint, from the flesh-coloured felspar in it, and often includes masses of mica slate. When polished, Peterhead granite is a general favourite. Dartmoor granite, of which London Bridge is built, is grayish and porphyritic. The Cornish granites, which are of Carboniferous and Triassic age, are very variable, but afford some good stones; they are usually porphyritic, and often contain schist. They have been employed in Waterloo and Westminster Bridges and in the Thames Embankment. Other good granites are obtained from Donegal, Galway, Leinster, Monme, and Newry. The Leinster granite from the Killiney quarries has been used for Kingstown Harbour, and also in the Thames Embankment. Newry granite was employed for the steps, &c., of the Albert Memorial, Hyde Park. Granite makes a poor paving stone and road metal, as it is very liable to soften and disintegrate; the granitic rocks and greenstones, in which hornblende is an important constituent, are better suited for this purpose, as they afford a tough and resisting stone.

Of other silicious stones, sandstone is the most important. Some varieties afford good building and flagging stones; they occur principally in the Devonian, Old Red Sandstone, and Carboniferous formations. Permian and Triassic sandstones, as a rule, disintegrate rapidly, but good and lasting stones have been obtained from Coin-Cockle Muir, Dumfriess, and from some other places. Quartzites are used for rough building purposes; some varieties afford good fire stones, and also good road metal.

Argillaceous Stones.—The principal variety of this class is the rock from which we get our roofing slates; these are chiefly of Cambrian age, the most noted quarries being those of North Wales. Good slates have also been obtained from the Silurian rocks. To this class also belongs the clays from which bricks and terra cotta are made. These artificial stones are by no means unimportant, BRICK having been used as a building material from a very early date, and terra cotta coming into extensive use at the present day, a fine example being the new Natural History Museum at South Kensington.

Calcareous Stones furnish us not only with many varieties of very excellent building stones, but also with the lime from which the CEMENTS, &c., to bind these together are made; it is therefore the most important class of all. Limestones occur in all geological periods, and most of them afford good building stones. The more crystalline, which are capable of receiving a polish, are termed marbles. Many of the beds of the CARBONIFEROUS or MOUNTAIN LIMESTONE produce good stones, and some of them good marbles; fine examples of the use of this limestone will be found in Glasgow, Edinburgh, and Leeds; the supports of the Menai Bridge are built of it. It was also employed in Christ's Church Cathedral and St. Patrick's Cathedral, Dublin; in the latter, however, Caen stone was also used, and the steeple is of granite. The Permian or Magnesian limestone is an excellent stone; it was employed for the Houses of Parliament, Westminster, but many of the stones have not lasted well, probably owing to the effects of the city atmosphere, or to a careless selection of the stones, as in Nottingham and Yorkshire castles built of this stone in the reign of William I. still retain the chisel marks sharp on the stones. The Bath Oolite is of variable quality, but good stones can be obtained from it; however, it does not always retain its colour, becoming quite black in some aspects; it was much used in the building of Westminster Abbey, and the new Truro Cathedral is built of it. The Portland Oolite affords a very excellent stone, which was employed in the building of St. Paul's Cathedral. Caen stone, an even-grained, cream-coloured Oolite from Normandy, has enjoyed a high reputation in this country for internal use in buildings, and has been extensively employed in Canterbury Cathedral and Westminster Abbey; the stone, however, is liable to decay in this climate. The chalk, as a rule, is an inferior building stone, but it has been used for internal decorative work in some of our cathedrals; however, the indurated chalk, or white limestone of Antium, produces very good stones. The Nummulitic limestone (Tertiary) affords a good stone in many places; it was employed for the Pyramids of Egypt.

Of the numerous marbles we may mention a few. Carrara marble is procured from Italy; there are several varieties: the pure white, which is preferred for statuary, does not withstand this climate, but the Sicilian, with black wavy streaks through it, lasts well. From the Carboniferous rocks, beautiful red and black marbles are procured in Cork, Derbyshire, and elsewhere. The Purbeck marble occurs in the Oolitic series; it is a beautiful grayish marble, with numerous fresh-water shells (Paludina) through it; there are fine specimens of it in the Temple Church. Calcareous stones do not make good road metal, for although during fine weather the roads may be in good order, when rain falls the carbonic acid dissolves out the carbonate of lime, and the stones disintegrate.

For a detailed account of these stones see Hull's "Building and Ornamental Stones."

BUILTH, a market-town of South Wales, in the county of Brecon, situated on the south bank of the Wye, which is here crossed by a stone bridge, forming a communication between Brecknockshire and Radnorshire. It is 16 miles N. from Brecknock by the road. About a mile from the town there are saline and chalybeate springs. The population of the parish in 1881 was 1455. The town also is known as Llanfair.

BUKOVINA, a duchy of Austria, in Southern Galicia. It was ceded to Austria by Turkey, 7th May, 1775, united to Galicia in 1777, and formed the circle of Czernovitz from 1786 till 1819, when, according to the political division then established, it was again constituted a duchy. It is traversed by the upper branches of the Sereth, Moldava, and Pruth, and consists partly of rich level land, and partly of hilly tracts dependent on the Carpathians. The valley of the Sereth is well tilled and fruitful, the plains

between the Dniester and Pruth are treeless, with many stagnant pools; on the mountain borders there are extensive forests and wild rocky wastes. The climate and productions are thus of a very mixed character. Corn, fruits, and wine are the chief products of the plains; and the mountain tracts are rich in silver, copper, lead, iron, sulphur, salt, and gypsum, and there are many mineral springs. There are Tertiary and volcanic rocks in the plains and in the S., chalk hills in the N., and old rocks in the mountain boundary. The easy passes over the Carpathians, between the Bistritza and the Theiss, tempted the successive hordes of Asiatic invaders to cross through it into Hungary; and it was thus for ages one of the chief battle-fields of Europe. The people are chiefly Ruthenians and Roumanians, the rest Germans, Magyars, Poles, and Jews. The area is 4028 square miles. It is divided into nine districts, and the capital is Czernovitz. The population is 571,671.

BULAK, BOULAC, or BOOLAK, a town of Egypt, forming one of the suburbs of Cairo. It is situated on the Nile, and ships bringing cargo to Cairo discharge here. It was burned by the French when in Egypt in 1799, and rebuilt by Mehmet Ali. There is a Khedival palace and a valuable collection of Egyptian antiquities here.

BULANDSHAHR, a district in the Lieutenant-governorship of the North-western Provinces of British India, lying between 28° 3' and 28° 42' N. lat., and between 77° 20' and 78° 31' E. lon. The area is 1910 square miles, and the population 950,000.

The district forms a portion of the Doab, or divided plain enclosed between the Ganges and the Jumna, and presents the usual sameness which characterizes all parts of that monotonous tract. Its surface exhibits to the eye much of a uniform level of cultivated soil, stretching from one great boundary river to the other, with a scarcely perceptible watershed in its centre, separating their respective tributaries. The plain here, as elsewhere throughout the Doab, is naturally dry and barren, intersected by sandy ridges, and rapidly drained by small water-courses, which have excavated for themselves a network of petty gorges in the loose and friable soil. But this unpromising region has been turned into a garden of cereals, cotton, and dye-plants by the industry of its inhabitants and the enterprise of its modern rulers, especially through the instrumentality of artificial irrigation. The Ganges Canal passes through the whole length of the district from north to south.

Wheat, barley, and grain are the staple products of the *rabli* harvest, and common millet, and pulses of the *thar*. Indigo is also widely cultivated, forming one of the main commercial crops; and cotton, safflower, and tobacco are grown in all parts of the district. The chief exports from Bulandshahr are safflower and indigo, but large quantities of cereals are also despatched eastward and westward. The district not only supplies its own needs in the consumption of cotton, but has a surplus available for exportation.

There is a thriving trade in wool down the Ganges from Amnushahr, and also in country cloth sent upwards from the same town.

The climate is very variable, being cold in winter and hot in summer, dry during the sultry spring winds, and extremely moist during the autumn rains. Malarious fever is the chief endemic disease of Bulandshahr, being especially prevalent during the rainy season.

BULANDSHAHR (or Baran), the administrative headquarters of the above district, is situated on the west side of the Kali Nadi, and consists of an upper and lower town, the former and more ancient portion being situated on the raised bank overhanging the *khadir* or alluvial lowland of the river, while the later or modern town stretches over the low-lying ground to the west. Baran is a place of great antiquity, coins of Alexander the Great and the Indo-Bactrian kings of upper India having been found in or around it. At the commencement of British rule it

had, however, sunk to the rank of a ruinous village, inhabited chiefly by Lodhas and Chamars, who lived in mud hovels in the low-lying suburbs; but when the administrative headquarters were fixed at this place the inhabitants of the neighbouring hamlets flocked to the new station, and Bulandshahr rapidly rose to the dignity of a flourishing and populous town. The present population is 15,000.

BULAU (*Gymnura rafflesii*) is a curious animal, allied to the HEDGEHOG, but possessing some of the characters of the SWEET, discovered by Sir Stamford Raffles in Sumatra. It has since been found in Borneo and Malacca. Of its habits nothing is known. The head of the bulau is much elongated and compressed from side to side, the muzzle being produced into a proboscis. The eyes are rather small, and the ears rounded, conspicuous, and naked. The body is stoutish posteriorly, and terminates in a long, smooth, scaly tail, which supports a few thinly-scattered hairs. The mass of the fur is soft, but from beneath this downy covering there projects a multitude of long, harsh, bristle-like hairs, which are particularly numerous along the back. The limbs are well developed, and terminate in plantigrade feet, having five toes furnished with curved claws. The jaws are armed with forty-four teeth—twelve incisors, four canine, sixteen premolars, and twelve molars.

BULBUL is a name applied to the NIGHTINGALE by Indian and Persian poets, and rendered familiar to English readers by Lord Byron. The name is also given to a member of the THRUSH family which is abundant in Southern India and Ceylon. This bird, the Red-vented Bulbul (*Pycnonotus hamorrhous*), is of a brownish colour above, with the head and tail black, and whitish beneath, with the vent red. The head has a conspicuous crest. This bird is found either in pairs or in small flocks in gardens, fields, and jungle, but always in open parts of the latter; it feeds on fruits and insects, and is very destructive to pease, strawberries, &c. Its note is rather harsh and unmusical, but it is said to be able to imitate the notes of other birds when caged. It is often kept for the purpose of fighting, which it does with great spirit, the combatants seizing each other by the red feathers of the vent, and endeavouring to pull them out. The Jooose Bulbul (*Pycnonotus jooose*), also an inhabitant of India, is a sprightly active bird, found both in woods and gardens. Its note is a pleasant chirrup. It lives chiefly on fruits and seeds, but it also eats insects. It is a favourite with the Hindus, who train it to sit upon the hand, and carry it with them to their bazars and other places of resort.

BULDA'NA, a district of Bihar, British India, lies between 19° 51' and 21° 1' N. Lat., and 75° 58' and 76° 52' E. lon. The area is 2807 square miles, and the population 410,000.

The soil of the undulating highlands in the east of the district is remarkably fine, and the wheat grown here will bear comparison with any produced in India. None of the rivers of the district are navigable. One of the most remarkable physical features is the Lake of Lonar, on the most southerly plateau. The circumference is 5 miles, and it appears to be the crater of an extinct volcano. The salts which it yields are used for washing and drying clintzes, for which purpose they are exported to considerable distances. A temple on its bank is held in great veneration, and is by far the finest specimen of Hindu architecture in Berar.

Many varieties of fruit and forest trees, some of the latter yielding gums and dyes, flourish throughout the district. Bears, tigers, panthers, hyenas, *sambhar*, *nilgai*, and wild hogs are met with in the hills, and antelopes and spotted deer in the valley, which is often visited by wild hogs and *nilgai*; black and gray partridge, quail, and waterfowl are among the smaller game.

In the north portion of the district strong and very hot westerly winds prevail from the middle of February till

rains fall, early in June, and excepting just about daybreak they continue throughout the twenty-four hours.

In the rainy season, and from October to February, the mornings and nights are pleasantly cool, but the heat in the day is still great. In the Balaghat or south portion of the district the hot weather is not excessive, the temperature of the rainy season is pleasant, and the cold weather of about three months is most enjoyable, but the great dryness of the air at that time is trying to some constitutions. The principal diseases are fevers, bowel complaints, small-pox, and affections of the skin and eyes.

BULGARIA, PRINCIPALITY OF, was created by the treaty of Berlin, signed 13th July, 1878. The boundaries were very minutely defined by the treaty, and are nearly identical with those of Bulgaria as a province of European Turkey, viz. lat. 52° 8' and 45° 20' N., lon. 22° 15' and 29° 35' E. It is separated N. by Roumania from the Danube, and S. by the Balkan Mountains from Eastern Roumelia, having Serbia on the E., and on the W. the Black Sea. It is 300 miles long by from 60 to 100 miles broad, and its area is about 25,000 square miles. The principality presents the appearance of a plateau, which gradually ascends from the steep banks of the Danube to the Balkans, a celebrated mountain chain (the ancient Hæmus), the peaks of which rise to 6000, and in one instance to 9000 feet high. The descent on the southern or Roumelian side is rugged and precipitous, but northwards it is more gradual, by numerous ramifications from the crest which runs through Bulgaria. These offshoots form systems of low hills, generally wooded or covered with rich pasture, and separated by valleys or small plains drained by feeders of the Danube. Though well wooded, the lower hills do not possess the magnificent forest-trees of the higher Balkan range. In some places they are covered with a thickly-set jungle of dwarf oaks. The great mountain chain is penetrated by passes and defiles, two of the principal being Trajan's Gate and the Iron Gate, the one leading to Sophia and the Danubian valleys, the other to Varna and the Black Sea. It was through the passes that General Diebitsch, in 1829, penetrated to Adrianople with an army of Russians. Another celebrated pass is that of Schipka, which was the scene of some most severe fighting between the Russians and Turks in 1877. The principal rivers are the eastern branch of the Morava, which enters Serbia; while flowing through the valleys which lie eastwards, and seeking the waters of the Danube, are the Isker, Vid, Osma, Jantra, and the Lom; the Kamtelik and Pravadi enter the Black Sea.

The population of Bulgaria at the census of 1881 was 1,998,983. The principality is divided into nine provinces, viz. Widdin, Sistova, Rustchuk, Varna, Tirnova, Sophia, Philippopolis, Slivno, and Skoblia or Uskup. Each of these is divided into several arrondissements or circles. The capital of the principality is Sophia, with a population of 20,000. The other principal towns are Varna, with an estimated population of 25,000; Shumla, with 22,000; Rustchuk, with 27,000; Tirnova, with 12,000; Gabrova, 15,000 to 20,000; and Widdin, 14,000. Besides these there are from fifteen to twenty small towns of from 2000 to 3000 inhabitants each. The great majority of the population live by the cultivation of the soil and the produce of their flocks and herds.

The number of 1,998,983, above stated, by no means comprises the whole of the Bulgarian people. These are dispersed over the entire region from the Danube to the Egean, and from the Black Sea to Albania and modern Greece. Reckoned altogether at from 5,000,000 to 6,000,000, they are by far the most numerous and important race in the Balkan peninsula. The original treaty negotiated by the Russians at the close of the war with Turkey in 1878—known as the treaty of San Stefano—contemplated the erection of a state which should comprise

the greater part of the Bulgarian nation. At the Congress of Berlin, however, it was decided that the portion of this state south of the Balkans should remain under the political and military authority of the Sultan, that it should be granted a condition of administrative autonomy, and be known under the name of Eastern Rœnnelia. Bulgaria pays an annual tribute to the Sultan, and bears a portion of the Turkish debt.

The typical Bulgarian has been described as strongly built, with broad shoulders and round back; coarse, blunted-looking features, a heavy moustache covering the lip, little twinkling eyes, and a walk like that of a bear. He is neither so tall nor so fair as the Serb, nor is he so dark and short in stature as the Rouman or Wallach. From community of origin he has many characteristics in common with the Serb, but he differs essentially alike from the Rouman and the Greek. Where Bulgarians and Greeks, however, reside side by side, the former compare very favourably with the latter in all solid and valuable elements of character. And if the Bulgarian has less of the national aspirations and warlike tendencies of the Serb, he has this quality, that no amount of oppression can render him indifferent to his field, his horse, his flower garden, and to the scrupulous neatness of his dwelling. Moreover, the readiness with which a national militia was formed, and the warmth with which the northern Bulgarians espouse the cause of their southern and less fortunate brethren, would seem to indicate a strong martial and patriotic capacity, which had become dormant under centuries of Turkish misrule.

Agriculture is of a backward and primitive character, yet owing to a most fertile soil and favourable climate good crops are produced. The plains are generally cultivated, and to the south of the Balkans the hill slopes are covered with vineyards. The main staples produced are wheat and Indian corn. Flux, hemp, and tobacco are also grown; fruit is abundant, and large quantities of wine are made; grain is raised in largest quantities in the neighbourhood of Silistria and the plains of the Danube, and some considerable quantity of our grain imports are derived from this district. Sheep farming is also carried on to a great extent, together with the rearing of cattle and horses. The manufactures are mostly confined to coarse cloths, but there is, in addition to this, one important industry, the manufacture of attar, or rose-oil, the rose-plant being largely cultivated for this purpose in the southern parts of Bulgaria, at the foot of the Balkans, and the prepared perfume is exported to England, France, and other countries.

The language has the oldest records of any of the Slavonic tongues; its version of the Bible, made in the ninth century, is the accepted version throughout the Slavonic division of the Greek Church, and it has thus become the church language of all those countries.

The Bulgarians are of Slavic origin, their country having before the year 679 been occupied by Slavs, who had driven southwards or exterminated the old Thracian race. These settlers were in their turn subdued by the more warlike tribe of Bulgares, who descended from their resorts on the Volga, and who, like the Turks, were of Tartar or Finnic origin. The Bulgares, after giving their name to the country and the language, became absorbed in the more numerous Slavic race; and by the beginning of the ninth century the interblended people, under kings of their own, had risen into a formidable power, and were in a state of chronic feud with the Greek empire. In 861 the country south of the Balkan was ceded to them, and received the name of Zagora. In the same year the Bulgarian king, Borgoris, and his people, embraced Christianity, and at the end of the tenth century, under King Samuel, Ochrida, on the Albanian border, became the seat of their power and patriarchate. Bulgaria continued as an independent kingdom until the beginning of the fourteenth century, when it was overthrown by the Emperor Basil II.,

who has been termed the "Slayer of the Bulgarians," and the country became subject to Hungary. Finally, together with other parts of the great Servian empire, Bulgaria lost its independence and political existence in the single battle of Kossowa, 15th June, 1389, when it passed under Turkish rule. The conquest of Bulgaria, however, was much more thorough than that of Bosnia, Montenegro, Servia, and Greece, for the Osmanlis utterly exterminated whatever remained of the Bulgarian nobility, so that the present rayahs are the descendants of the serfs who were attached to the soil of a large part of what has been known as modern Turkey. Crushed and subdued, the Bulgarians seem to have resigned themselves impassively to this condition, and meekly to have passed under the yoke of their Moslem masters. As in Bosnia and Albania, many of them, in order to retain their lands, became Mohammedans; but the Bulgarians as a whole were, and unquestionably still are, Christians, and the most prominent national sentiment expressed by them of late years has been one of persistent opposition to the supremacy of the Greek patriarchate of Constantinople. In 1856 the Bulgarians petitioned the sultan for the right of electing the chief dignitary of their church, and of choosing the governor, but without result. In 1859, at the instigation of Russian influence, they refused to pay dues to the Constantinople patriarchs, and expelled their bishops. Between 1860 and 1870 Prince Gortschakoff made several representations to the Porte on behalf of the Christians of Bulgaria and of the Bulgarian Church, and in 1870 a firman was issued by which an independent church administration was granted. In 1872 a Bulgarian exarchate was formed, the Bishop of Widdin being elected exarch.

The Osmanli rule of four centuries by no means tended to elevate and instruct. Laws of public education were passed, notably the excellent one of 1869, but in Bulgaria, as in other parts of Turkey, it remained a dead letter. Some successful efforts were made of late years by the Bulgarians themselves, and by American missionaries, to establish primary schools; but the bulk of the adult inhabitants remained decidedly ignorant and very superstitious. The industry and frugality of the Bulgarians were for many years the chief levers of the fiscal resources of European Turkey; but yet they had to endure all the worst features of Turkish misgovernment, and any symptom of discontent or rising of the peasants was suppressed with cruel severity. Goaded to desperation by the injustice and extortion of their Moslem rulers, many of the Bulgarians would from time to time join the ranks of the Hajduks, or mountain brigands—bands which constituted themselves the guardians of the rayahs, and lived by taking revenge on their oppressors. Such a questionable kind of confederacy had existed in the Balkans for centuries, its members being connected with the peasants by ties of common descent and friendly intercourse, and finding shelter in their homes during the severity of winter. Robbers by profession in time of peace, the Hajduks became patriots in time of commotion or war. The comparatively trifling insurrection in the mountainous region between the Balkan and the Rhodope ridge in May, 1876, was the work of the Hajduks, and some few unhappy peasants were compelled to join in the movement. On this being discovered, most terrible reprisals were made by hands of Bashi-Bazouks and Circassians—to such an extent, indeed, as to rouse the indignation of Europe, and to lead to the Russo-Turkish war of 1877, the chief events of which took place in Bulgaria. It was here that, in spite of the most wretched mismanagement on the part of the military chiefs at Constantinople, the Turks once more asserted the splendid valour of their race before being finally forced backward to a diminished territory beyond the Balkans. And it was here that Osman Pasha, by his memorable and brilliant defence of Plewna, held in check for about six months the

great army which Russia poured into the country. In 1879, under the terms of the Berlin treaty, a national assembly and a prince were chosen.

BULIMUS is a genus of molluscous animals belonging to the order GASTEROPODA. The animals of this genus closely resemble the common SNAIL (*Helix*), to which they are nearly allied. They are inclosed within a shell, which is oblong or turreted, and composed of many whorls. The aperture is longer than wide, with the longitudinal margins unequal. The species are very numerous, upwards of 650 having been described. They are found in all parts of the world, and vary much in shape and appearance. These animals abound most in warm climates, and pass the dry season in a sort of torpor or deep slumber, buried at the roots of trees, in moss, or in the thick brushwood. They have the same power also as the common snails of undergoing long fasts; and instances have occurred where they have remained in a state of deep slumber for the space of twenty months. Their eggs are sometimes very large, and are covered externally with a hard calcareous shell. It appears that the tropical, and more especially the arboreal species, cement leaves of trees together, curling one upon another, so as to form an artificial nest for the reception of these large eggs. *Bulimus orbatus* (see Plate GASTEROPODA), a South American species, is 6 inches long, and is eaten at Rio. Its eggs have a brittle shell, and the young, when hatched, are an inch in length. A fossil species, *Bulimus ellipticus*, is found in the BEMURDOK BEDS of the upper Eocene series.

BULJANAK, a small river in the Crimea, taking its rise near Simferopol, on the banks of which the first encounter occurred in 1854 between the allied French and English troops and the Russians. This was a cavalry skirmish, in which about 1500 Cossacks, supported by artillery, endeavoured to enter 500 British horse, of the 8th and 11th Hussars and the 13th Light Dragoons, into a snare. It took place on the 19th of September, 1854, the day before the battle of the Alma.

BULK HEADS, the transverse partitions of a ship, designed to separate it into rooms, to strengthen it transversely, or to afford an additional safeguard against wreck. Bulkheads of the last-mentioned description are generally called water-tight bulkheads, and are made of iron and provided with doors that can be closed very firmly so as to resist pressure. All the fighting ships of the navy, most transport and passenger vessels, and many of the ordinary merchant service, are built in this way. They have very frequently proved of immense value in practice, and when properly made and managed they add enormously to the security of a vessel. It may be questioned, however, whether our naval architects have yet fully succeeded in the design of these compartments, for there are numerous instances on record where large ships which had been built in so-called water-tight compartments have found them quite without avail in the case of sudden leakage, collision, or similar disaster.

BULL, DR. JOHN, a musician of considerable eminence in the Elizabethan period. He was born in 1563, and educated in the Queen's Chapel. He took his degree of Bachelor of Music at Oxford in 1586, and of Doctor at Cambridge in 1592. In 1596, after having served many good appointments, Dr. Bull was named the first professor of music in GRESHAM COLLEGE, London, "but because at this time Master Dr. Bull, who is recommended to the place by the Queen's Most Excellent Majesty, being not able to speak Latin, his lectures are permitted to be altogether in English," &c., says the ordinance. This exception from the obligation to lecture first in Latin and then in English still remains in favour of music to this day at Gresham College. Dr. Bull is one of the composers in Queen Elizabeth's "Virginals Book," and joined Byrd and Gibbons in other instrumental collections. Boyce's selection

contains examples of his vocal music, sufficient to show that his great contemporary reputation was well merited. The last ten years or so of his life Dr. Bull spent abroad, dying at Antwerp, where he had become organist, in March, 1628. The fact that makes Dr. John Bull always noteworthy to Englishmen (apart from the peculiarity of his bearing the national sobriquet) is the strong claim that has been put forward to his having been the composer of GOD SAVE THE KING. The reasons for assigning to another the composition of that most famous tune are given in the article under that heading.

BULL, PAPAL, an edict issued from the papal chancery, and so named from the *bullo*, or leaden seal, which is appended to it. A bulla was, amongst the ancient Romans, who themselves borrowed the practice from their predecessors the Etruscans, a mark of patrician birth. It was a circular boss or stud of gold, sometimes hemispherical, sometimes of less convexity, and was worn round the neck by a gold cord. In later times the bulla was worn by all children of free birth. Our word "bullion," for gold coined into discs, comes from bulla. The similarity of shape between the seals attached to edicts and these bullae, and also the personal identification which each alike gave, caused the seal also to be named bulla; and indeed it is highly probable that the actual bulla was in early times taken from the neck and attached to a document of importance, whose authenticity it was of great necessity to establish. [See BRUIT.] Bulls are written on parchment. The seal bears on the obverse the heads of St. Peter and St. Paul; on the reverse the name of the pope, and the date of the year of his pontificate. In France, in Spain, and in most other kingdoms professing the Roman Catholic faith, bulls are not admitted without previous examination. In England, to procure, to publish, or to use them is punishable by 13 Eliz. c. 2, as a præmunire. The name bull has also been applied to certain constitutions issued by the emperors. In affairs of the greatest importance bullae of gold were employed, whence they were called Golden Bulls.

Eleven folio volumes, published at Luxemburg between 1747 and 1758, contain the bulls issued from the pontificate of Leo the Great to that of Benedict XIV., from A.D. 461 to A.D. 1757. The two most celebrated among them are—1. "In Cænâ Domini," which is read every year, on the day of the Lord's Supper (Maundy Thursday); it denounces various excommunications against heretics and other opponents of the Romish see. 2. The bull "Unigenitus," as it is called from its opening words, "Unigenitus Dei filius," issued by Clement XI. in 1713, condemning 101 propositions in Quesnel's work, or, in other words, supporting the Jesuits against the Jansenists in their opinions concerning divine grace.

BULL RUN, the name of a creek, near Manassas Junction, Virginia, United States, which was the scene of two important battles during the American Civil War. The earlier was the first engagement which took place during the conflict, and was fought on 21st July, 1861. The Federals, under General Irvin McDowell, commenced the action, and for some time the advantage was on their side; but on the arrival of some Confederate reinforcements they were seized with a sudden panic, and notwithstanding the exertions of their officers, fled in disgraceful rout to Washington, abandoning a large quantity of arms, and ammunition, and baggage. The Confederate generals, Beauregard and Johnston, did not, however, think it prudent to pursue them. A second battle was fought at the same place, 30th August, 1862. The conflict was a desperate one, but it again ended in the triumph of the Confederates, who were under the command of General "Stonewall" Jackson, the Northern army being commanded by General Pope.

BULL TROUT. See TROUT.

BULLACE, the English name of a kind of plum, the *Prunus institia* of Linnaeus. It is closely allied to the

sloe, but the tree is larger and much less spiny—in fact, it may be regarded as intermediate between the plum and the albe. The fruit is larger than the sloe, generally globose, and although it partakes in some degree of the acidity and roughness of the sloe, it is not unpleasant, especially after having beer mellowed by frost.

BULL-BAITING and **BEAR-BAITING** were amusements of our ancestors, replacing the gladiatorial combats of ancient Rome and the bull fights of contemporary France and Spain. Brutal as they were, therefore, they indicated an advance on the sports of other nations. The bull or bear was fastened by a chain to a stout post, and then set upon by dogs. The spectators sat on raised benches round the arena. When, as sometimes happened, the infuriated animal got loose, the spectators were in no small danger. The dogs were a special breed, called **BULL-DOGS** (still cultivated by dog fanciers, though their occupation is happily gone), and their peculiarity was that no force could unlock their teeth when once they had a grip on their enemy. The proper mode of gripping the bull or bear was to "pin" him by the nose, and in his efforts to do this the dog was tossed by the one or bitten by the other, frequently with fatal effect. Elizabeth and James were great bull and bear baiters. The brutal sport, though in lessened favour, continued as late as William III., and in isolated cases even to the present century. In some English towns a bull-baiting was held annually, and there are several northern towns where the term "Bull Ring," retained as a name for a district, has come down as a memento of these gatherings. It was rendered illegal by Act of Parliament in 1835.

Up to about 1800 a somewhat similar sport, that of *bull-running*, was practised at Tutbury in Staffordshire, and at Stamford in Lincolnshire, once a year, six weeks before Christmas. A bull was turned out, to be pursued with sticks by the whole of the idle folk of the place.

BULL-DOG is a variety of Dog remarkable for its strength and obstinate courage. In former days the bull-dog was used in the barbarous sport of bull-baiting. As the taste for this sport has died out the bull-dog has declined in numbers and popularity, and is now looked on with disfavour by all but dog-fanciers. Its ugliness is extreme. The head is very large, and the muzzle is much blunter and broader than in the mastiff; the lower jaw projects considerably beyond the upper; the eyes are set far apart, and project from the head; the legs are short, thick, and crooked, and the tail is tapering. The chest is very broad and strong. The bull-dog is much smaller than the mastiff, which dog it probably in former days more nearly resembled both in size and characters. With regard to its size, Darwin says—"There can be no doubt that the fancy bull-dogs of the present day, now that they are not used for bull-baiting, have become greatly reduced in size, without any express intention on the part of the breeder." The more peculiar characters of the bull-dog, the crooked legs and underhung lower jaw, are undoubtedly due to carefully selected and perpetuated variations.

The bull-terrier is a cross between the bull-dog and the terrier.

BULLER, CHARLES, a Liberal politician, who promised to be a statesman, was born at Calcutta in 1806, his father being then a member of the Bengal civil service. He received his early education at Harrow, which he quitted with the highest honours. He studied subsequently at Edinburgh, and there had for one of his tutors Thomas Carlyle. His education was completed at Cambridge. Sent to the House of Commons on the eve of the Reform Bill (for which, of course, he voted), as member for West Looe, he delivered his maiden speech in 1830; and after the disfranchisement of West Looe, he sat until his death for Liskeard, where also his family had influence. Mr. Buller's first notable parliamentary achievement was, Low-

ever, scarcely a political one, though it involved a great public benefit. On the 18th of February, 1836, in a speech received with great applause, full of wit as well as sense and knowledge, he moved the appointment of a select committee to investigate the affairs of the record commission. Some two years afterwards, Lord Dugham, on his appointment to the governor-generalship of Canada, took Mr. Buller with him as his civil secretary. In 1841 he had a short term of office as secretary of the Board of Control. In the House of Commons he was rising rapidly, by the freshness of his style, the lucidity of his statements, his general candour and originality as a speaker, and last, not least, by his airy sparkling wit, which relieved his treatment of the driest and most hackneyed subjects. On the formation of Lord John Russell's ministry, he was appointed to the modest post of judge advocate-general; but in July, 1847, having been appointed a queen's counsel the previous November, he was made a privy councillor. In 1848, when the poor-law commission broke down beneath the weight of public obloquy, Mr. Buller, at a considerable sacrifice of income, accepted the presidency of the new and remodelled commission. But his career was prematurely closed; he died of typhus fever on the 28th of November, 1848.

BULL-FIGHT, a very ancient and barbarous amusement, which, under different modifications, has descended to modern times, and is found in many of the countries of Europe. Bull-fights were known to the ancient Egyptians, and also to the Greeks, more than 300 years before Christ. The Thessalians had their regular festivals or days of bull-fighting. The bull-fight, as we understand it, was not included in the games of the Roman amphitheatre. It appears to have been common among the Moors, who are generally said to have introduced it, with the *djerd* and other equestrian and warlike sports, into Spain in the eighth century. Bull-fights are held in the chief cities of Spain about fortnightly, lasting three or four hours, during which time some eight or ten bulls are slain. Though revolting to anyone with a sense of humanity, and disgusting from the quantity of blood of bulls, horses, and men, which frequently flows in the arena, a true Spanish bull-fight, such as those exhibited at Madrid, Seville, Cadiz, and the great cities of Spain, is an exciting spectacle. In the first canto of Lord Byron's "Childe Harold" there is a description of one at Cadiz, which is as correct as it is poetical. The *picadores*, mounted on horseback, first inflict slight stabs on the animal to provoke it to fury. He is further excited by the *chulos*, who strike small barbed darts into him and wave bright cloaks before his eyes. The *matador* then enters, and all the interest centres on the last encounter. He stabs the bull near the shoulder, and if he be skilful kills him at the one stroke. If his stroke fail he is in the greatest danger.

Bull-fights are now almost confined to Spain. Elsewhere, if they exist, as at Nîmes and Arles in France, they are sorry spectacles, retaining all the repulsive features without any of the fierce excitement and danger, and under the growing pressure of public opinion are doomed soon to disappear.

BULLFINCH (*Pyrrhula*) is the name of a genus of birds allied to the **FINCHES**, belonging to the section **CONTORTURES** of the order **PASSERES**. The bullfinches are characterized by the short, stout, and somewhat compressed form of their bills, of which the ridge of the upper mandible is convex.

The Common Bullfinch (*Pyrrhula vulgaris*) is a well-known bird in all the wooded districts of the British Islands, and of Northern and Middle Europe generally, associating during the winter in small families, which separate on the approach of spring. It extends through Asia to Japan. Although the natural note of the bullfinch is only a low soft twittering, it may be taught to whistle musical airs with extraordinary precision and sweetness of tone; and

great numbers are annually educated in Germany for the purpose of sale, many being imported into our country. On the subject of training these birds, Bechstein gives good directions. It would appear that the young vary in their facility of instruction and in the correctness of their ear. Some can whistle three distinct airs without confusing them, but few can execute more than a single air and a short prelude. When tame the bullfinch becomes very familiar, and shows attachment to those who feed and notice it, displaying at the same time no little intelligence.

In its natural state this bird feeds on seeds during the summer and autumn, but in spring and winter it supports itself chiefly on the buds of trees and shrubs, and especially on those of the apple, pear, peach, plum, and other garden trees, and is often the cause of extensive mischief. Mr. Selby states that he has known a pair of these birds strip a considerable-sized plum-tree of every bud in the space of two days. These buds are not swallowed whole, but first minutely divided by the cutting edges of the powerful bill. Wedgwood considers the name of the bird to be a corruption of *bulfinch*.



Bullfinch (*Pyrrhula vulgaris*), male.

The bullfinch forms a loose shallow nest of small twigs lined and intermixed with fibres of roots in a low tree in thick underwood, or in a solitary quickset hedge. The eggs, five in number, are bluish white, spotted with pale orange brown. The young are hatched at the end of May or early in June, and there are often two broods in the year.

In the south of Europe the bullfinch is rare, and occurs only as a bird of passage. In our island it is stationary, and also in Germany, where it abounds in the wooded districts.

The female is duller and paler in all her tints than the male, which may certainly be ranked among our most beautiful birds. The ruff of the neck and back are fine bluish grey; the top of the head, throat, wings, and tail, velvet black; the cheek, neck, and breast, red. In captivity hybrids between the bullfinch and canary have been produced, but such instances are very rare. Other species of the genus *Pyrrhula* are found in Asia, Africa, and America.

BULL-FROG (*Rana pipiens* vel *mugans*) is a frog belonging to the order BATRACHIA. Bull-frogs are found in almost every marsh and pond of North America, and in general are solitary in their habits, only collecting together in the breeding season, at which time hundreds may be seen in one small pond. Their food consists of crustaceans, insects, and snails. The bull-frog is a large species, reaching even to the length of 21 inches, the body alone measuring 7 lengthwise, 4 or 5 across, and weighing about 2 lbs. The head is very large, broader than long. It has a very large mouth, great prominent eyes, and the vocal sacs are internal. The body is thick, smooth above, and in front it is of a green colour; dusky, with only a greenish tinge behind, and marked with irregular blotches of dark brown. On the sides and belly it is of a yellowish tint, fading almost to a dusky white.

The croak of the bull-frog is so loud as to resemble the

distant bellowing of bulls. Certain portions of the larynx are concave externally and convex internally, so that when the entrance to the larynx is closed they form a dome over the windpipe, which Cuvier aptly compared to a kettle-drum. The bull-frog is figured in the article BATRACHIA.

BULL-HEAD (*Cottus*) is a genus of ACANTHOPTERYGII, belonging to the GUNNARD family. In this genus the head is rounded in front, broad and depressed. The body is tapering and considerably compressed behind, and is totally devoid of scales, being covered with a soft skin. The jaws and vomer are furnished with five conical teeth. The pectoral fins are rounded with simple rays.

The bull-heads are small fishes found near the coasts and in rivers and streams in the northern temperate zone. They are never found in deep water; the greatest depth, according to Günther, attained by any species being 565 fathoms, from which a Japanese species, *Cottus bathybius*, was dredged. About forty species are known.

The River Bull-head or Miller's Thumb (*Cottus gobio*) is abundant in rivers in the British Islands and the greater part of Europe, and extends into the north of Asia. This little fish is about 4 or 5 inches in length, white on the under side, and brownish black above. Its food consists chiefly of small crustaceans and the larvæ of water insects. It prefers sandy or gravelly streams, lying concealed beneath stones in wait for its prey. This fish, like the maigre, the herring, and other fishes, emits curious sounds, due to terror, when captured. The female is said to deposit her spawn in a hole in the gravel, where she remains watching till the eggs are hatched. The flesh is reddish when boiled, and is considered by some to have a very delicate flavour.

Two other species of the genus *Cottus*, the SEA-SCORPION and the FATHER-LASHER, are common in British seas.

BULLION is the term for gold and silver, both coined and uncoined, in a state of purity fit for coinage. The celebrated "Bullion Report" of a parliamentary committee appointed in 1810, and guided chiefly by Mr. Horner and Mr. (afterwards Sir Robert) Peel, established the conclusion that paper money is always liable to be over-issued, and consequently depreciated, unless it be at all times convertible into gold and silver. Accordingly, under the Bank of England Charter Act (7 & 8 Vict. c. 22), the circulation of notes by the issue department of the bank is fixed at a certain amount, and any addition to the circulation must be based on bullion only. The proportion of silver bullion to be retained in the issue department must not exceed one-fourth part of the gold coin and bullion. All persons may demand of the issue department notes in exchange for gold bullion at the rate of £3 17s. 9d. per ounce of standard gold, to be melted and assayed by persons appointed by the bank, at the expense of the persons who tender the bullion. See BANK.

BULL-RUSH or **BUL-RUSH**, the English name of *Scirpus lacustris*, one of the CLUB-RUSHES. It grows in rivers and ponds, and reaches often a height of 6 feet. The flowers are disposed in a compound panicle at the top of the stem; the glumes are without hairs, and the nut is obovate and three-cornered. Sometimes there are long flat floating leaves. The plant flowers in June and July. It is a native of the British Isles. The name is also applied to *Typha latifolia* and *Typha angustifolia*, two marsh plants bearing long black cylindrical masses of flowers. They flourish luxuriantly during July and August among other aquatic plants which fringe our quiet lakes and pools. The stem is often over 6 feet in height. See TYPHACEÆ.

BULWARK, a name formerly used to designate a bastion or rampart, and hence any means of defence. In a ship the bulwarks are formed by the continuation of the sides above the level of the upper deck. They serve to protect the loose articles stowed on deck, and the crew or passengers from being thrown off by the rolling of the ship, and as a protection against the waves. In the vessels of

the royal navy the bulwarks are made strong enough to resist rifle bullets, so as to protect the seamen during an engagement.

BULWER, SIR HENRY LYTON, G.C.B., a distinguished statesman, diplomatist, and author, was born in 1804. He entered the diplomatic service in 1827. From November, 1832, he was attached to the embassy at Paris down to November, 1835, when he was appointed secretary of legation at Brussels. Two years later he was sent in the same capacity to Constantinople, where he negotiated and concluded a treaty which is the foundation of our present commercial system in the East. In November, 1843, he was appointed minister plenipotentiary to the court of Madrid, in which capacity he negotiated the peace between Spain and Morocco. His position here was rendered difficult by the reactionary policy of the Spanish statesman Narvaez, to whom the firmness and candour of Bulwer proved very unpleasant. In 1848 he was compelled to leave Madrid, but his conduct there gained him the united support of the House of Commons, and the queen awarded him the highest decorations of the order of the Bath. In April, 1849, he was nominated British minister at Washington, from whence he was transferred in the same capacity to the court of Tuscany in 1852. In 1856 he was nominated by Lord Palmerston commissioner at Bucharest for investigating the state of the Danubian Principalities. As British commissioner he elicited from every minister and every government concerned the warmest expressions of approval, and all agreed in recommending him to the post of ambassador to the Ottoman Porte on the return of Lord Stratford de Redcliffe in 1858. In 1871 he was raised to the peerage with the title of Lord Dalling and Bulwer. He died 2nd June, 1872. He was the author of "An Autumn in Greece," "France, Social and Literary," "Historical Characters," and a "Life of Lord Palmerston." He was the brother of the novelist Lord Lytton.

BULWER-LYTTON. See LYTON.

BUL'BOAT, a boat used for the purpose of trading between ports and harbours with vessels lying outside. Wedgwood ("Dict. of Eng. Etym.") London, 1878) says, "The wide fishing boats of Holland are still called *bulboots*; and the word is probably originally *bulboet*, a *bul* being a well or receptacle for keeping fish alive." They are generally managed by women, the articles traded in being chiefly fresh provisions of various kinds and articles of clothing. In the royal navy they are allowed to attend vessels fitting out or paying off for a few hours daily, but are restricted to meal times for ships in active commission.

BUMMARÉE is the curious looking name applied to wholesale fish dealers in the Billingsgate Fish Market in London. The word comes from the French *bonne mare*, "a good catch of fish." Many strong attempts have been made to overthrow the tyranny of the bummarées and of Billingsgate itself, since by this close corporation dealing in this small market the price of fish is often doubled and trebled, until it becomes a luxury instead of one of the cheapest of foods. The bummarée buys by auction from the salesman the large parcels in which fish arrives at the market from the fisheries, and then he retails the fish to the fishmongers in quantities suitable to each one's consumption.

BUN, a small round sweet cake, about whose origin there is some discrepancy of opinion. Skeat, in his monumental "Etymological Dictionary of the English Tongue" (1882), gives the derivation of the word as from the provincial French *bune*, cake, the same as *bigne*, or its diminutive *beignet*, the last being still used for a kind of small round fritter. But it certainly is the fact that the Good Friday hot cross bun is the direct descendant of the *boun*, the sacred cake with the branching horns of a bull stamped upon it, offered at the Arkite temples every seventh day. Hesychius, Julius Pollux, Diogenes Laertius, &c., mention

the *boun* and its marks; and the "cakes" of the prophet Jeremiah, for offering which to the queen of heaven he reproves the children of Judah (Jer. vii. 18; xlv. 19), are the same *bouns*. The sign V for the horns carelessly made, or doubled for symmetry's sake, would become a cross, and such pagan "cross buns," 3 inches in diameter, found at Pompeii and Herculaneum, may be seen in the interesting museum at Naples. The Christians availed themselves of the custom ready to their hand, and the pagan bull's horns became on the hot cross bun the remembrance of the crucifixion, the bun itself standing for a type of the last passover bread that Jesus ate.

BUNDELKHAND, a tract of country which may be defined as lying between the river Jumna (Jamuna) on the north, the Chambal on the north and west, the Jabalpur (Jubbulpore) and Sagar (Sangor) divisions of the Central Provinces, British India, on the south, and Rewah or Baghelkhand and the Muzapur Hills on the south and east. The plains of Bundelkhand are diversified by a series of mountains and hills, classed in three ranges. From these hills numerous streams flow towards the Jumna. Except where hill or jungle predominate, as in several of the native states, the province is almost solely agricultural. The British districts are included within the North-western Province. The political superintendence of the native states is vested in the Bundelkhand Agency, subordinate to the Central India Agency, reporting to the government of India.

Out of thirty states in Bundelkhand of more or less importance, only four have formed treaties with the British government.

BUNGALOW, the Bengalee name for a house of one story. It is used by the English in India to designate their private residences of all descriptions, the officers' quarters at military stations, and sometimes even for the barracks of the soldiers. *Dak bungalows* are thatched cottages maintained by the government along the main roads for the accommodation of travellers.

BUNGARUS is a genus of venomous SNAKES belonging to the same family as the COBRA. The Banded Bungarus (*Bungarus fasciatus*) is common in Bengal, Southern India, and Burma, and is known on the coast of Cochin by the name of *Bungarusa pariah*. It attains a length of 6 feet, and is considered by the natives of India as very deadly. The body is nearly of equal size throughout, the head being rather small, and scarcely distinct from it. Its tail is short, keeled above, nearly of equal size as the body, and terminating in a corded tip or round blunt point. Its body is encircled by large bands, alternately black and yellow, and generally there is a large white spot on each side of the neck, sending off a white streak to the crown, the two meeting there and forming an arrow-shaped mark.

Another species, *Bungarus coromandus*, is the upper parts of its body bluish and the lower parts white. It is also an inhabitant of India.

BUNGAY, a market town in the county of Suffolk, 31 miles N.N.E. from Ipswich, and 113 from London by the Great Eastern Railway, is surrounded by the Waveney on all sides except the south-east, the river here assuming the outline of a horse-shoe. Having been nearly destroyed by fire in 1688, the town is well built and regularly laid out. It is a quiet rural place, with a considerable trade in grain and other provisions, malt, coal, and lime, and a well-attended market. The trade of the town is promoted by the Waveney being navigable thence to Yarmouth. The market place is said to be the best in the county, and has two fine crosses. The town has a free grammar school with two exhibitions to Emanuel College, Cambridge, and several other educational establishments. There are some manufactures of silk, and an unusually extensive printing office. The church is noticeable for its circular tower. The whole building was restored in 1865. Some remains

of the flint walls and keep of the ancient Castle of Bungay, formerly the seat of the Bigods, may be seen in the garden of the King's Head Inn. There are also some remains of a Benedictine nunnery. The town is divided into two parishes. Population, 3579.

BUNION, a subcutaneous swelling, generally seated on the inner side of the ball of the great toe, but sometimes found also over other bony prominences of the foot. It is usually caused by the pressure of ill fitting or tight boots, its formation being accelerated by much walking. It first appears as a painful and tender spot, which gradually swells, owing to the effusion of fluid below the skin. This is followed sometimes by considerable inflammation, leading to the formation of matter and subsequent ulceration, while more frequently the swelling becomes permanent, presenting a hard but sensitive surface. After much exercise this swelling becomes painful and inflamed, and if the pressure and irritation be prolonged they may even cause the formation of an abscess there. In the earliest stage, when a tender spot only has appeared, the best treatment consists in the avoidance of all pressure and the use of soothing applications, such as a pad of wet lint covered with oiled silk at night, or the covering of the part with a little soap plaster spread upon a piece of kid or wash leather. In the second stage, when there is an effusion of fluid, painting the part with tincture of iodine will often bring about its dispersion. It must be kept covered with the tincture for some time to produce the desired effect. In those cases where a bunion has become permanent but little can be done to effect a cure. Care should be taken always to wear boots that are wide enough to allow sufficient room for the toes, and the sole should be shaped so as to avoid undue pressure upon the part. When the bunion becomes painful and inflamed, rest and the application of hot fomentations, or linseed meal poultices, will generally be found sufficient to afford relief. Other methods consist in painting the inflamed bunion with tincture of *ceratrum viride*, or the application of a caustic taken by means of a hot covered with a piece of oiled silk.

BUNKER'S HILL, a steep hill 110 feet in height, in Massachusetts, United States, in the centre of the peninsula on which the town of Charlestown is built, and about a mile north of Boston. Here on the 17th June, 1775, was fought one of the earliest and most remarkable battles of the American revolutionary war. The royalist troops, having established themselves on a position of this height during the night, a British force advanced to dislodge them; but though the latter ultimately effected their purpose, the resistance made by the Americans was such that the British lost 1054 men killed and wounded, while the American loss was only 450 killed and wounded. A splendid obelisk of granite has been erected on the top, to which each state of the Union contributed a stone. It is 39 feet square at the base and 221 feet high.

BUNSEN, CHRISTIAN CHARLES JOSIAH, BARON, scholar, theologian, and diplomatist, one of the most distinguished men and finely-balanced characters of his day. He was born at Korbach, 26th August, 1791, and died at Bonn, 28th November, 1869. He studied first at Marburg, and afterwards (from 1809 to 1813) at Göttingen, under the celebrated philologist Heyne. His first publication was a treatise on Attic Law—early indicating the grand combination of erudition and learning with the business of life for which his future career became so characteristic. In 1813 he left Göttingen unwilling, as a true German, to accept office under the imperial sovereignty of *Jérôme Bonaparte*, then tottering to its fall. In Holland and Denmark, to which he next proceeded, he enjoyed the instructions of *Immanuel Kant*, while prosecuting those profound studies in the Old German and Icelandic dialects which he had already commenced under *Bruce* and *Lachmann*. In 1815 he went to Berlin, and made the

acquaintance of Niebuhr. In 1815 he studied Persian and Arabic under the famous *Sylvestre de Sacy* at Paris, and in the same year went to Rome, where, through the influence of Niebuhr (then Prussian plenipotentiary to the Papal court), he in 1818 received the appointment of secretary to the embassy. About this time Bunsen married an English lady—a circumstance prophetic of his future intimate connection with this country. In 1827, after Niebuhr's removal to Bonn, Bunsen succeeded to his office as Prussian minister in Rome. Besides Roman topography and archaeology, we find him at this period engaged in ethnological studies of a far-reaching character; in the study of Platonic philosophy; and again occupied with profound researches on biblical criticism, church history, and liturgical formulas. His attention was directed to Egyptian antiquities by the visit of Champollion to Rome in the year 1826. To the importance of the great discovery made by this extraordinary genius his eyes were immediately opened, and in his great work on Egypt he did ample justice to the genius of the great Frenchman. In 1839 we find him again in the Prussian diplomatic service as ambassador at Rome. In 1841 he was called to Berlin to arrange the affairs of a new English-German bishopric to be created in Jerusalem. For this purpose he was despatched to England, and shortly afterwards he was made Prussian ambassador in this country as successor to Baron Bülow. This important situation he filled for fourteen years, and the fruits of his residence were of great political consequence both to England and Germany. He took an active part in all public questions. In 1848 he defended vigorously the rights of the German element in the duchy of Holstein against the King of Denmark, who was supported by Lord Palmerston and the English government. In 1854, on occasion of the Russo-Turkish war, he used equal independence of judgment, and an eye no less clear, for the true interests of Germany; but as the Russian party were yet too strong in Berlin for such decidedly English sympathies as Bunsen exhibited in the movements which led to the Crimean expedition to be officially tolerated, he resigned his post in London, and went to live as a private man in Heidelberg, prosecuting to a triumphant close that long course of historical and theological study which he had never for a single day remitted during his long course of public life in the busy metropolis of the British empire. He, however, never ceased, by stirring pamphlets and otherwise, to let his voice be heard on important public questions which deeply interested him as a German and as a Christian; and he, moreover, always maintained his firm hold of the affections of the monarch, who at an early period discerned his worth. Of this the most remarkable proof was the high honour conferred on him by the King of Prussia in creating him a *freiherr*, or baron, with a place in the Prussian Upper House, under circumstances and conditions alike honourable to the constant favour of the royal bestower and the dignified consistency of the man on whom so great a distinction was conferred.

The extraordinary activity of Bunsen's mind will be best illustrated by an enumeration of his various works—some of them of immense compass—which he contrived to publish amid the various occupations of public life. The following is a list of his principal works:—"De Jure Atheniensium Hereditario" (Göttingen, 1813); "Beschreibung der Stadt Rom," three vols. (Stuttgart, 1830-43—of which he is only part author); "Allgemeine Evangelisches Gesang und Gebetbuch" (Hamburg, 1816); "Elizabeth Fry, an die Christlichen Frauen und Jungfrauen Deutschlands" (Hamburg, 1843); "Die heilige Leidensgeschichte und die stille Woche" (Hamburg, 1841); "Die Verfassung der Kirche der Zukunft" (Hamburg, 1845—English, London, 1845); "Ignatius von Antiochien und seine Zeit" (Hamburg, 1847); "Die drei echten und die vier unechten Briefe des Ignatius von Antiochien" (Hamburg, 1847); "Die

Basiliken des Christlichen Roms" (Munich, 1843); "Christianity and Mankind" (Jena, 1854, in seven volumes); "Die Zeichen der Zeit" (Leipzig, 1855—English, 1856); "Ägyptens Stelle in der Weltgeschichte" (volumes i. and ii., Hamburg, 1845—volumes iii., iv., and v., Perthes, 1856-57); "Gott in der Geschichte" (Leipzig, 1857); and the great "Bibelwerk," meant to be the crowning work of the author's life, but which had to be finished by his assistants after his death, which took place 28th November, 1860. The idea of the work is to interpret the best results obtained by biblical scholarship since its revival at the latter end of the last century. A most admirable memoir of Bunsen, in two volumes, was published by his widow (London, 1869).

BUNT is a disease which attacks wheat. The infested grain does not present any unusual appearance; in fact, it is only when it is crushed that the farmer discovers that the tough skin incloses a sooty powder with a disagreeable smell. This disease is a fungus, the life-history of which has been investigated by the Rev. M. J. Berkeley, a great authority on fungi. The black powder, when examined under a high power of the microscope, is seen to consist of dark spherical bodies (*spores*) with net-work markings on the outside, and attached to slender threads (*mycelium*) by side branches. When the diseased grain is crushed—for instance in thrashing—the spores are set free, and adhere to the surface of sound grains of wheat. At this stage they do no injury, but when the seed is sown, the spores germinate by putting out a thick thread. At the end of this coarse thread there soon appears a tuft of short delicate threads, which become united by cross growths. These again germinate, and the long slender threads which are the result produce another crop of small spores. The threads which proceed from the smallest spores are able to penetrate the tissues of the wheat, grow with its growth, and pursue their insidious course without interfering with its vegetative life. The name of this pest is *Tilletia caries*; another species attacks the durra or Indian millet. Other fungal diseases of wheat are *Mildew*, *Rust*, and *Smut*.

BUNTER SANDSTONE is the lowest member of the TRIAS; it comprises a series of red sands and conglomerates, of from 1000 to 2000 feet thick. In Great Britain they are succeeded and sometimes overlapped by the Keuper series; but in Germany the muschel kalk, a calcareous and very fossiliferous bed, rests on them; this, however, is absent in England. They rest unconformably on the older rocks of Permian, Carboniferous, and sometimes of Cambrian age. In the centre of the series there is a quartzose conglomerate, based by a calcareous breccia. The beds are fossiliferous in England, and are supposed to have been deposited in a salt lake or in brackish water, probably in a great inland sea. The breccia is supposed to indicate glacial conditions, some of the blocks being striated. A few marine shells have been found on the Continent. In England the beds are exposed in Durham, Yorkshire, Lancashire, Cheshire, and Stafford. In Leicestershire and Warwick they are poorly developed; they also occur in Scotland and in the north east of Ireland.

BUNTING (*Emberiza*) is a genus of birds of the FINCH family, belonging to the section **CONTORTINES**, of the order **PASSERES**. The buntings have a short, stout, conical bill, with a narrow palate, which is furnished with a hard knob, of service to the birds in breaking up the hard seeds constituting the greater portion of their nourishment.

The Common Bunting (*Emberiza miliaria*) is a well-known bird in all parts of Europe, extending also into Asia. It is abundant in most of the cultivated districts of Britain, where it frequents corn-fields, and may often be seen perched on the sprays of the hedges, and uttering its somewhat harsh notes. Its nest is built at the bottom of the hedge under the protection of the brambles which usually flourish in such situations; it is composed of straw, grass,

and roots, and lined with hair. The eggs are four or five in number, and of a pale reddish or purplish colour, with purplish-brown streaks and spots. During the breeding season the buntings live in pairs, but in the autumn they become gregarious, and during the winter associate in considerable flocks, with which chaffinches and several other kinds of small birds are often mixed. They frequently roost on the ground like the skylarks, and are caught with them in nets and brought to market for the table. In length the common bunting is rather more than 7 inches. It is of a pale-brown colour above, with longitudinal dark brown streaks; the quill feathers of the wings and tail are dark brown with pale edges; and the lower surface is brownish white, with numerous spots and lines of dark brown on the breast and flanks.

The Reed Bunting (*Emberiza schoeniclus*) is common in Britain and all parts of Europe. It frequents marshy places, where it dwells and builds its nest amongst the reeds, rushes, and osiers. It is a pretty little bird, about 6 inches long, and readily distinguished by the deep black colour of its head, chin, and throat.

The Chaff Bunting (*Emberiza cinerea*) is a rare bird in Britain, being usually seen only on the south coast, where, however, it is not unfrequently breeds. It is a common species in the south of Europe and North Africa. It is about 6½ inches long. The plumage is of an ashy-olive colour, with longitudinal black streaks; above and below the eyes are streaks of yellow; the back is reddish, the throat black, and the lower part of the neck and belly yellow.

The ORIOLE and YELLOW-HAMMER also belong to the genus *Emberiza*. The SNOW-BUNTING belongs to the closely-allied genus *Plectrophenax*.

BUNTING, JABEZ, D.D., a distinguished Wesleyan minister, was born at Manchester, 13th May, 1779. He was educated at the grammar school of that town, and when quite a young man entered the Wesleyan ministry, in which he was destined to exercise an influence second only to that of the founder of the society. He was elected president of the conference four times—first in 1820, and afterwards in 1828, 1836, and 1844. In 1834 he was appointed president of the Wesleyan Methodist Theological Institution, and he was one of the missionary secretaries for over eighteen years. An eloquent preacher and platform speaker, and an earnest worker in the cause of religion and philanthropy, his greatest ability was displayed in the departments of polity and administration, while he was also successful in raising among his brother ministers a high standard of professional attainment. He retired from official life in 1857, and died 16th June, 1858. He was buried in the graveyard attached to City Road Chapel, London, in which lie the remains of John Wesley.

BUNYAN, JOHN, the author of the "Pilgrim's Progress," was born at Elstow, near Bedford, in 1628. His father was a tinker, and after sending his son to the village school, where he learned to read and write, he brought him up to his own trade. At the age of seventeen he entered the Parliamentary army, and served during the campaign of 1645. At the Siege of Leicester one of his comrades, who had undertaken a particular service in his stead was shot dead at his post, an event which Bunyan ever regarded as a special intervention of providence on his behalf. Soon after he returned home and resumed his trade, and at the age of nineteen married a pious young woman, who brought him as her only marriage portion two volumes of practical theology, which she persuaded him to read. The perusal of these works led to a "religious awakening" in his mind, and then began that course of mental struggle which he has so graphically described in his autobiographical work, entitled "Grace Abounding to the Chief of Sinners." His sufferings during this period were intense, and terrible visions of evil spirits, tormenting voices, suggestions of blasphemy, fears that he was not numbered with the elect,

that he had sold his master like *Judas*, that he had committed the unpardonable sin, all beset him, until his health failed and he was almost on the verge of insanity. Yet it does not appear that he had really led a vicious or immoral life during the earlier part of his career. It is true that he refers to his own conduct during his youth and early manhood in terms of bitter reproach, but the only particular vices to which he pleads guilty appear to be habits of profane swearing, Sabbath-breaking, dancing, playing at tip-cat, and ringing the church bells. Some of his biographers have accepted his own estimate of this part of his life, and have represented him as being almost a monster of depravity. This is certainly most unjust, and it is now generally thought that in his own account of his sinfulness there is to be traced an extreme religious sensibility rather than a record of actual transgression. Ultimately his doubts gradually cleared away, and in 1653 he joined a Baptist society at Bedford under the pastorate of a Mr. Gifford. Within two years of this he was invited to engage in the work of the ministry, and he began to preach. His discourses attracted much attention in the district, and for five years he laboured with increasing success. At the end of this period, just about five months after the restoration of Charles II., on the 12th November, 1660, he was arrested as being "a common upholder of unlawful meetings and conventicles," and as he had refused to desist from preaching, he was committed to Bedford gaol, where he remained for twelve years and a half. To support his wife and several young children, one of whom was blind, he learned a new trade, that of making long tagged tin tubs, and at this he worked incessantly, selling them when made to peddlars and hawkers. His library consisted of the Bible and Foxe's "Book of Martyrs," and one or two works of a devotional character, to which he studied with indefatigable zeal. Persecution filled the gaol with captives of a congenial character, and a little church was formed there of which he became the pastor. There also he preached, and most probably wrote too, his immortal allegory, the "Pilgrim's Progress," to which it was not completed until about 1670. His imprisonment, at first severe, gradually became milder, and at last he was allowed to pass some of his time outside the gaol, and he obtained the use of his house in September, 1672, when his name was included in the general pardon passed by Charles II.

After his discharge from prison, his popularity as a preacher who had suffered martyrdom, led to great numbers of his place of worship had to be enlarged. On his frequent visits to London, when he delivered his weekly addresses in the large chapel in Southwark in which he preached was invariably thronged with eager worshippers. He was not wholly uneducated, but always considered himself "poorly educated." When the Act of Uniformity was passed in the reign of James II., Bunyan did not hesitate to avail himself of its provisions, although he despised and denounced the "popish religion" of the measure. Next year came the Revolution, and the Toleration Act; but Bunyan did not live to see the happy day of England's deliverance from the yoke of Rome. His last illness was superinduced by exposure to wet weather, and ended in an attack of kindly intercession on the part of a friend who had offended his father. He had succeeded in returning home by way of London, where he was caught in a drizzling rain, and arrived in a state of exhaustion at the house of his friend, Mr. Stairs, near Holborn-badon. Here he was seized with fever, and after two days' illness, which his frame, weakened by a previous attack of the mysterious sweating distemper, was less able to resist, he died in peace on the 31st of August, 1688, in the sixtieth year of his age. His last hours were full of Christian hope. His remains were interred in Bunhill-burying-ground, where his tomb may still be seen. A handsome bronze statue of Bunyan was erected at Bedford in 1874.

Bunyan will always hold rank as one of the first among practical religious writers in the English language. His simple style and Saxon sagacity, his wonderful genius and profound acquaintance with the Bible and the human heart, fitted him for his work, without the aid of scholarship. He had studied but two great volumes—the Scriptures and his own experience; but the latter was such as few men ever had access to, and he had made himself master of the treasures of the Bible. His want of learning and of exact training made him, indeed, defective as a textuary; but no man ever drew from the Bible more thoroughly the great principles of faith and practice. He wrote much in varied forms in prose and rhyme, and always with power. His very verses, doggerel as they must be admitted to be, have a rough vigour in them that disclose the man. His practical and experimental treatises are admirable, full of passages glowing with the light of a splendid imagination. He wields the controversial pen with a sturdy hand, and has a formidable power of logic, though not borrowed from the schools. His great charm lies in the clear pithy style and the dramatic vivacity of his writings. His words are direct, strong, and unmistakable. His questions, answers, exclamations, apostrophes, personifications—individualize his readers, and takes them by the hand, so that his pages are never dull and his words never wasted. The tone of John Bunyan, however, rests most securely on his allegorical writings. Thousands that have scarcely known him as a writer of practical treatises, or have only heard of his "Grace Abounding," have studied him in the pages of the "Pilgrim's Progress." Who has not heard of it, and who that has ever opened a religious volume has not read it? There is no book, we believe, the Bible alone excepted, that has been translated into so many languages—few that have been read by so many classes. It pleases the child by the resistless charm of its simple pictorial story; it instructs, by its rich theology, the mature Christian; its genius captivates the man of letters. It has passed through numberless editions—editions small and large, with comment and without—editions annotated, illustrated, illuminated—editions that have been laid as ornaments on the drawing-room table—editions that have lain well thumbed upon the cottage window-sill. It has been imitated, supplemented, modernized, turned into rhyme, it has been read, referred to, quoted, analyzed, learned from, till the characters and incidents of its story are as familiar to us as those of the Bible narratives, and its language, like that of Scripture, has woven itself into the texture of religious discourse. The pilgrim described in it has been mapped out with its stations, as if it were a real journey, and its shadowy personages have become almost as real to our conceptions as the heroes of history. Bunyan himself is hardly more creditable than his Christian. His "Holy War," though more elaborately ingenious, has always been less popular; but eminent critics have declared that if the "Pilgrim's Progress" had not been written, this would stand first among the allegories of European literature.

It has been remarked that Bunyan's treatises were as numerous as his years. The following are his principal works, with the dates of publication, as given in Charles Doe's "Catalogue Table," circulated in 1691. The dates within parentheses are supplied by George Offor, one of Bunyan's most enthusiastic editors:—"Gospel Truths Opened," 1656; "Sighs from Hell" (1659); "The Holy City, or the New Jerusalem," 1665; "Grace Abounding to the Chief of Sinners" (1666); "Justification by Jesus Christ," 1671; "The Pilgrim's Progress," 1678; "Come and Welcome to Jesus Christ," "The Holy War," 1682; "The Barren Fig-tree," 1683; the Second Part of the "Pilgrim's Progress" (1684); "The Life and Death of Mr. Badman" (1686); "The Pharisee and Publican," 1686; "The Jerusalem Sinner Saved," 1688; "Solomon's Temple

Spiritualized," 1688. He wrote also "Defence of the Doctrine of Justification," 1672, against Mr. (afterwards Bishop) Fowler; and "Differences about Water-Baptism no bar to Communion," 1673.

BUONAROTTI, MICHAEL ANGELO. See MICHAEL ANGELO.

BUOY DUES. All ships which enter a port within the jurisdiction of the Trinity House have to pay a small sum as buoy dues. This is sometimes charged on the tonnage of the vessel, while in other cases ships are subject to a fixed charge, or pay an annual rate.

BUOY, LIFE, or LIFE-PRESEVER. Anything lighter than water, used as a means of personal safety on account of its buoyancy, may be considered a life-buoy. Various substances have from time to time been tried for this purpose, but cork is now most generally preferred; and the buoy which has of late years most successfully won its way into the favour of seamen consists of a kind of hoop, composed of slices of that material, about 32 inches in diameter and 6 inches in width, with a thickness of about 4 inches. It contains altogether about 12 lbs. of cork, is compactly covered with painted canvas, and furnished with lines to afford a more convenient hold, and under ordinary circumstances will support at least four men. In fact, it has been estimated that 1 lb. of cork is sufficient to support a man of ordinary size and make.

The crews of the National Life Boat Institution wear a life-belt composed of cork, and tied over the shoulders and around the waist. Many lives have been saved by this apparatus, as it is quite sufficient to keep a man afloat, and, on the other hand, it does not at all interfere with the action of the arms either in swimming or rowing. Many varieties of life-buoys have been made of india-rubber inflated with air, including mattresses, jackets, and waist-coats, but the general objection to them is that they are liable to be rendered altogether useless by being punctured or torn, and are also often subjected to decay by being put away while damp.

One of the best, known as the "Boyton Life Dress," was introduced into England from America in 1875. It is made of solid india-rubber, and is in two parts, the lower being the pantaloons, to which boots are attached, and the upper the tunic, with sleeves, gloves, and helmet connected to it. The pantaloons are formed with a waist belt or hoop of steel, which is elastic, and has a rib of india rubber running round the outside. The tunic has a similar rib of rubber around the inside of the waist, which is drawn over and contracts under the rib on the pantaloen belt, and by its elasticity, gripping it tightly, forms a water-tight joint. This joint is further secured by an outer belt of rubber fastened with a buckle. Having put on this suit in the order indicated in our description, the operator next proceeds to inflate it, which he does by blowing in turn through five tubes, fitted with stop valves, each tube communicating with an air-chamber. Of these chambers there are two in the pantaloons, two in the tunic, and one in the helmet. In the front of the helmet an aperture is left large enough to show the eyes, nose, and mouth of the operator, and the act of inflating the helmet brings the edges of the rubber in close contact with the face, so that there are only a few square inches of exposed surface. The suit weighs 15 lbs., and when fully inflated is said to be capable of sustaining a weight of 300 lbs., which allows for the weight of a person saved by the wearer from drowning, besides which the inventor has provided for the contingency of damage to any one of the air-chambers. The suit when out of use is packed away in an india-rubber bag weighing about 2 lbs. This bag has a compartment round the mouth in which 3 gallons of water may be stowed away. In the bottom of the bag are placed provisions, signal lights, &c., and air is blown into the water compartment, which expands the mouth of the bag inwards,

and so closes the opening, which can further be strapped tight. As the dress fits loosely, and is put on over the ordinary clothing, the temperature of the body is equally maintained. With a little practice the dress can be put on and inflated in two minutes. The dress is in constant use in the American Life-saving Service; and after having given it a year's severe trial, the American government have adopted it for their naval service.

BUOYS (Fr. *houes*, Ger. *ankerbojen*, Dutch, *ankers-bouen*) are floating logs of wood, or hollow chambers of wood or iron, moored so as to float on the water at some certain spot, in order to point out the course or channel that a vessel should follow. Like many sea terms (see *BY-MOOR*, for example) this comes from the Dutch. In Dutch *boei* means a fetter as well as a buoy, the latter being originally a floating log of wood chained or tethered to a mooring. No doubt this comes from the Latin *boia*, a fetter.

Until the thirty-sixth year of Queen Elizabeth all public buoys in this kingdom were under the management of the lord high admiral, but in that year (1594) the queen, by a warrant dated 14th of June, granted to the corporation of the Trinity House of Deptford Strand the right of "making, erecting, setting up, placing or laying out, all buoys, beacons, marks, and signs, for the sea or sea-shore, to hold the same with all profits and emoluments thereunto belonging, as of the manor of East Greenwich, in free and common socage." On laying down any public buoy, the officers of the Trinity House Corporation give notice to the public of its form, colour, and exact situation, and of the reason for its being laid down; and notifications are also made, upon their removal, whether the same arises from design or through accident.

By sec. 114 of "The Merchant Shipping Act, 1854," it is provided that if any person wilfully or negligently removes, alters, destroys, hides, or makes fast to, or runs foul of any buoy, he shall, in addition to the expenses of making good any damage so occasioned, incur a penalty not exceeding £50.

The forms of buoys are extremely varied, and experience has hardly yet decided in favour of any one particular kind. The prime requisites in a buoy are, that it shall be conspicuous, distinctive, and permanent. In form it should be angular and in colour dark. Although, as just stated, the best shape is still a matter of opinion, the question of colour is so far definitely settled, that black and red are now the only colours used singly in painting buoys. It may seem strange, but it is nevertheless a fact, that the most practised eye finds it impossible at times in broad daylight to distinguish a red buoy from a black one, even when close at hand. White, after having been used singly for many years, has for several reasons—the action of the weather and water on it, the inability of the eye to distinguish it under certain conditions of light, or in a sea with any surf, and its general unsuitableness—been discarded, and is now only used on petty-coloured buoys. When white buoys were used it was invariably found that the dirtier they were allowed to get the more visible they became. The average size of buoys is about 8 feet, and they go on increasing up to 20 feet. The latter are now comparatively common, but up to 1849 an 8-foot buoy was considered sufficiently large for even an important station. The buoys cost from £25 to £250 each. The uniform system of buoyage now applied to all channels, consists in marking the starboard (right-hand) side entering by black or red buoys only, and the port (left-hand) side by black or red buoys checkered or striped vertically with white. Middle grounds, where they exist in a channel, are marked by black or red buoys with white bands or horizontal stripes; and other obstructions, in the shape of wrecks, are marked by green buoys. As before stated, all buoys are now made either of wood or iron, and there are many

arguments urged in favour of both kinds; but the latter are now preferred in most instances, and indeed as far as buoys of large size are concerned, iron has quite superseded wood. Numerous patents have been taken out from time to time for buoys of improved construction; and the manufacture of all large buoys entails a considerable amount of engineering skill.

Buoys are, with few exceptions, moored only by a single chain to a sinker or mushroom anchor. The chain varies in length from twice to three times the depth of the water at high tide, according to the size and position of the buoy. The sinker also varies in weight from 8 to 32 cwt., according to the size of the buoy. These moorings are much stronger than are absolutely required, but they save the frequent replacing which others more in proportion would probably render necessary.

Every three months the position of all buoys is verified; and every six months, in March and September, all wooden buoys, except the very large ones, are "shifted"—that is, replaced by chain buoys. This "buoy shifting" is a duty which calls forth all the skill and energy of the officers and men composing the crews of the Trinity House vessels, for the buoys are for the most part placed to guard dangerous shoals, and their change has often to be effected under very untoward circumstances. The buoys brought in are carefully surveyed, and either condemned as unfit for further service, or cleaned, repaired and painted for future use. The large buoys are not shifted regularly, but are cleaned and painted annually at their stations.

Some buoys are fitted with bells, generally weighing about 3 cwt., each, which are struck by clippers that are hung on all sides of them, and an Automatic Signal or Whistling Buoy has been invented, in which the motion of the buoy as it floats is utilized by means of an air pipe and piston to sound a large whistle fitted at the top. Another appliance is the light buoy, in which compressed oil gas sufficient to last several weeks is stored, and by means of a beautifully designed automatic burner and a protected lantern, is made to show a constant light which may be seen for about a mile and a half.

There are nearly 1000 buoys moored round the coast of England, and in the channels of its chief rivers. Scotland and Ireland have each rather under 200. It is the unanimous opinion of those most competent to judge on such matters, that the coast of England is better supplied with buoys than that of any other country in the world.

BUOYANCY is the power which certain materials have of being supported at the surface of a fluid so as to sink in it as much only as a part of their depth or thickness. Thus ice, some woods, &c., are said to have buoyancy in water, and almost all solid bodies have the power of floating in mercury. The term is frequently used to designate the weight which a solid mass of wood, or a vessel of wood or metal, will support in water. It is of course derived from Buoy.

It is shown in **HYDROSTATICS** that when a body is immersed in a fluid, the weight of the body, with whatever it may be equal to the weight of as much of the fluid as is equal in volume to the immersed part of the body. Hence, if the weight of a solid body, or its specific gravity, and the specific gravity of a fluid, are given, the buoyancy may be found. Thus, by the rules of mensuration, find in cubic feet the volume of the part of the body which is to be under water, or the depth of it, by the specific gravity of water, the product will be the weight of the water displaced; subtract from this product the weight of the body (if solid, this weight will be equal to the volume multiplied by the specific gravity of the body), and the result will be the required buoyancy, or the weight which it will carry without sinking lower than the given depth.

This proposition is useful in determining the amount of volume which would have buoyancy sufficient to raise

a sunken ship, or in ascertaining the dimensions of a floating bridge which may support a given weight of troops or artillery.

BU'PHAGA. See BEEF-EATER.

BUPLEURUM (from the Greek *bous*, an ox; and *pleuron*, side), a genus of plants belonging to the order **UMBELLIFERÆ**.

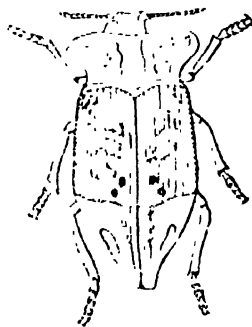
There are nearly ninety species. They are natives of temperate climates in the Old World. One species grows in South Africa and one in subarctic North-west America. They are known by the common name of *Hare's-ear*. When eaten by cattle they are supposed to injure them, and cause distension of the abdomen. The leaves are simple and entire, the calyx without teeth, the petals broad, inflexed at the apex, and somewhat hood-shaped, the fruit subobdymous, and styloped rather flat. The common English species, *Euphatorium rotundifolium*, which grows in chalky corn-fields, was in repute with the old herbalists as a vulnerary. It was called "Thorow-wax," because, in the words of Gerard, "every branch doth grow thorow everie leafe, making them like hollowe cups or saweers."

BUPRESTIDÆ is a family of **BEETLES** of the section **PENNYMERA** and group **STENOXYLI**. The members of this family have a hard body, with the head buried up to the eyes within the *prothorax*. The breast-plate covering the prothorax (*prosteronum*) has a sharp projection behind, which is received into a cavity of the middle breast-plate (*mesosternum*). In this way the different segments of the thorax are firmly interlocked. The antennæ are short and serrated. The legs are very short and retractile, with the tarsi dilated.

In splendour of colouring this family of insects surpasses all others among the beetle tribe. Green appears to be the most frequent colour; but shades of blue, red, golden or copper-like hue are not uncommon, and these colours are in most cases brilliant, or, as it were, burnished.

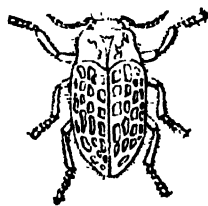
The **Buprestidæ** are found on the trunks and leaves of trees, and likewise on flowers (on the latter more particularly the smaller species), and when touched, or frequently

FIG. 1.



Polybothrys zygnana.

FIG. 2.



Julodis Rothli.

even when approached, they apply their legs and antennæ close to the body, and allow themselves to fall to the ground, a means of escape frequently practised by insects. They crawl slowly, but in hot sunny weather are frequently on the wing and fly rapidly.

About 3000 species have been discovered belonging to this tribe, which are for the most part from the tropics. In the temperate zone they are most abundant in Australia and Chili.

Polybothrys zygnana (fig. 1) is found in Madagascar, where the **Buprestidæ** are particularly curious and fine in form and colour. The genus *Julodis* (fig. 2) contains many large African species, often singularly covered with tufts of

yellow or gray hair. A species of the genus *Chrysocroa* is figured in Plate II., BEETLES. The elytra of some of the handsome Indian species of this genus are worked up and formed into artificial flowers, or into ornaments for ladies' dresses. The species found in the British Islands are of small size and few in number.

Fossil remains of the elytra of *Buprestis* have been found in the BOVEY TRACY BEDS, and of a genus closely allied to *Buprestis* in the STONEFIELD SLATES of the Oolites.

BURBAGE, RICHARD (died 1620), the original performer of the principal tragic characters of Shakspeare, and a portrait painter of acknowledged skill in his day, was the son of James Burbage or Burbadge, also an actor, to whom, with four others, Queen Elizabeth granted, in 1574, the first royal patent conceded in this country to performers of plays. James Burbage built the Blackfriars Theatre in 1576, and in 1596 we find the name of his son Richard appended with Shakspeare's to a petition to the lord chamberlain to be allowed to continue their performances therein. In 1603 Richard Burbage is one of the actors included in the license granted by King James I. to Lawrence Fletcher, William Shakspeare, and others. There are several other notices of him in legal records of the time. Richard Burbage is introduced in person in an old play called "The Returne from Parnassus," and instructs a Cambridge scholar how to act the part of Richard III., in which character he appears to have been greatly admired. Bishop Corbet, in his "Iter Boracale," speaking of his host at Leicester, says—

"When he would have said, King Richard died,
And called, 'A horse! a horse!' he Burbage cried."

In the "New Particulars concerning Shakspeare," Mr. Payne Collier says that the portrait of Shakspeare commonly called the Felton is supposed to be of Burbage's painting.

BUR BOT (*Lota vulgaris*) is a fish belonging to the Cod family (Gadidae), in the order ANACANTHINI. It is distributed over Central and Northern Europe and North America. Unlike most of the Gadidae it is a fresh-water fish. In England it is confined to the rivers of some of the north-eastern and eastern counties, and is not found in either Ireland or Scotland. The body of the burbot is elongated, about 2 feet in length, and covered with very small scales. There are two dorsal fins and one anal, the tail fin is oval and slightly pointed, the ventrals are narrow and composed of six rays. The under jaw is armed with one barbel. The jaws and the vomer are furnished with fine conical teeth arranged in bands. The body is of a yellowish-brown colour, white on the under side. The food of the burbot consists of shell fish, worms, &c. Its flesh is white and of a good flavour. In Rupert's Island a very nutritious bread is made of the eggs of the burbot mixed with a little wheaten flour.

BURCKHARDT, JOHN LOUIS, an eminent Oriental and African traveller, was born at Lausanne, in Switzerland, about 24th November, 1781. In 1800 he went to study at Leipzig, whence he afterwards removed to Göttingen. He came to England in 1806, with recommendations to Sir Joseph Banks, then an active member of the committee of the African Association, to which Burckhardt made an offer of his services to penetrate into Central Africa, by way of Fezzan, and his offer was accepted in 1808. In January, 1809, he received his instructions from the committee; he was to proceed first to Syria, there to remain two years to perfect himself in Arabic, afterwards to proceed by Cairo to Mourzook in Fezzan, and thence across the great desert to Soudan. He arrived at Aleppo in September, 1809, and remained two years and a half in Syria, during which time he wore the Eastern dress and assumed the name of Ibrahim. He next proceeded towards Egypt, by Palestine and the country east of the Dead Sea, and arrived at Cairo early in September, 1812.

As there was no favourable opportunity of proceeding to Fezzan for the present, Burckhardt set off in February, 1813, for Upper Egypt, and went into Nubia, where no European traveller had ever been beyond Deni, and on his return visited the temples of Abensambul, Dandour, Gyshe, Kalabshe, &c. In March, 1814, he visited Upper Nubia, and reached Jidda on his return in July, 1814. These two Nubian journeys of Burckhardt, the journals of which were published together in one volume, furnished much interesting and for the most part novel information.

Burckhardt next visited Medina and other places in Arabia, and, on 25th November, Mecca, which till then had been forbidden ground to Europeans, and went through the whole of the ceremonies in the character of a Mussulman pilgrim, without, as he believed, having excited any suspicion as to his real character. He spent three months at Mecca, and on the 25th November, 1814, performed the hadji or pilgrimage to Mount Ararat, in the company of more than 80,000 pilgrims from all parts of Islam. The particulars of Burckhardt's Arabian journey furnished the most complete account of the Hejaz and its two holy cities, Mecca and Medina, ever transmitted to Europe. After his return from Arabia, Burckhardt spent some months, partly at Cairo and partly at Alexandria, endeavouring to recruit his health, impaired by repeated attacks of fever, and preparing his Nubian and Arabian journals to be sent to the Association. In April, 1816, the plague having broken out at Cairo, he set off for the desert of Soudi, and on his return proposed to Mr. Salt the project of removing the head of Monmon, and having it conveyed to England for which purpose they engaged Brizosi. Burckhardt remained at Cairo waiting for the long-expected caravan from Fezzan, and preparing himself for the journey; but in October, 1817, he fell ill at Cairo of dysentery, and, notwithstanding every medical assistance, he expired in the night of the 15th. His death at the early age of thirty three, when he had so well fitted himself for the purposes of African discovery, was greatly deplored in Europe. His journals were published after his death by the African Association.

BUR DEN (of a song). The French word *bourdon*, derived from the Latin word *burbo*, "a drone-bee" (imitative of its humming or buzzing sound, no doubt), described the large permanently sounding pipe of the bagpipes, which we call a *drone*, from the same observed likeness to the perpetual droning of the bee. Such a *bourdon*, or *burden*, or constant drone, occurs in many old songs. "Fa, la, la," is a very favourite burden indeed. Few persons are ignorant of Morley's exquisite part song or "ballet" of Elizabethan date, to the words—

"My bonny lass she smileth,
When she my heart beguileth
Fa, la, la, &c."

Piers Plowman (A.D. 1362) quotes the favourite burden of his time as "Hey, trely, loly, le," and an existent song of Edward IV.'s reign has this burden between every two lines. Shakspeare's burdens are well known, "Hey, nonny, nonny," "For the rain it raineth every day," &c. This mode of writing is used to the present day by poets who wish to give quaintness to their verses. It was in especial favour with the pre-Raphaelite school, and is still beloved of their successors. Tenyson has not disdained to use the burden in some of his dainty songs; as, for instance, many of the lyrics in the "Princess." One of the sweetest of these has a double burden, beginning and closing the stanza—

"Ask me no more;
The moon may draw the sea,
The cloud may stoop from heaven and take the shag,
With told to fold, of mountain or of cape,
But O too fond, when have I answered thee?
Ask me no more."

"Burden," in this sense of continually harping on one string, is used very finely in the prophecies of Isaiah. "Thus is

the burden of Babylon." "The burden of Moab," &c. See the first verses of chapters 13, 15, 17, 19, 21, 22, 23, &c., of that wondrous poetry of inspiration.

BURDETT, SIR FRANCIS, BART., was born on 25th January, 1770, of a family that traced its descent from the time of the Conqueror. Sir Francis was educated at Westminster School, and afterwards spent some years on the Continent. In 1796, being then Mr. Burdett, he was returned for Boroughbridge, in Yorkshire. From his first entry into Parliament Sir Francis had followed an extreme course of popular politics, opposing the government and the war, advocating a reform in the representation, and especially distinguished himself by an inquiry which he procured into the abuses of the Old Bath Fields Prison, London. This led to his being brought forward for Middlesex at the general election in 1802, and again in 1804. Both elections were subject to parliamentary scrutinies, and the list is said to have cost him £100,000. In May, 1807, he fought a duel with Mr. James Paul, and at the second exchange of shots both were seriously wounded. While they lay ill, both were put in nomination for Westminster at the new general election; and the result was that, after a contest of fifteen days, Sir Francis was brought in at the head of the poll. He continued to sit for Westminster from this time for nearly thirty years. The great event of his subsequent career is his commitment to the Tower by the House of Commons in March, 1810, for a letter to his constituents denying the power of the House to imprison delinquents, which he published in Cobbett's "Political Register," and which the House voted to be libellous and scandalous. Sir Francis continued to adhere to the popular side in politics till April, 1835, when he went into opposition against his old friends in the government, on the ground principally of their paying too much deference to O'Connell and his followers in their agitation against the Irish Established Church. He declined standing for Westminster at the general election in July, 1837, but was returned for Wiltshire, and sat for that county till his death, which took place on the 23rd of January, 1844. He married, in 1793, Sophia, the youngest daughter of Thomas Coutts, the wealthy London banker. His daughter, Angela Gordon, created by Queen Victoria, for her benevolence, baroness Burdett-Coutts, was born on 25th April, 1814.

BURDOCK is the common name of a plant, *Trifolium lappula*, belonging to the daisy family, *Compositæ*. In outward aspect it has a very different appearance from the daisy; for it belongs to that section (*Cynarodæ*) of the *Compositæ* which includes the thistles. It grows to a height of 3 or 4 feet, with large, round, heart-shaped leaves, and the bracts forming the achene of the flower heads have hooked points. This plant is cultivated in Japan under the name of *Gobos*, as a culinary vegetable, and certainly if the stems are gathered young and peeled it forms a good substitute for asparagus. It grows freely, and has been recommended as a cover for phlegmatics. It was described and prescribed medicinally for rheumatic affections. The leaves are aromatic, besides the pungency of the bracts, has few flowers, without hairs, and the pappus short and deciduous.

BURDWAN. See BALDWIN.

BURETTE, a sort of instrument in chemistry, invented by M. Gay Lussac, for the purpose of dividing a given portion of any liquid into 100, or 1000, or any number of equal parts. It consists of a graduated tubular measure of definite capacity, with a smaller pouring tube attached to its side and communicating with the bottom. In English works Mohr's name has been associated with it. This is a graduated tubular measure drawn to a point at the lower end, and connected with another small portion tube by a conical connector, which is closed by a small brass finger clip. It is much used in all chemical factories.

BURFORD, a market town in the county of Oxford, 18 miles W. by N. from the city of Oxford, 82 from London, and 5 from the Shipton station of the Great Western Railway, is situated on the south bank of the Windrush. Some of the houses have fine wooden gables with panels and hanging tracery. Burford has diminished in wealth and importance, from the decay of the coarse woollen manufacture and the malting business which once flourished here, and from the diminished traffic along the line of road which passes through it. The church is large; it has a central tower of Norman date, a fine Norman doorway at the west end, and various portions of Norman and Early English adjacent to the tower; but the greater part of the building is of Perpendicular character and of various dates. A great battle was fought in the neighbourhood in 752, between Ethelbald, king of Mercia, and Cuthred, king of the West Saxons. The former was defeated. Edgehill, where Fairfax beat the Royalists, is in the neighbourhood. The celebrated Wilnot, earl of Rochester, was educated in its school. It gives the title of earl to the Duke of St. Albans. About a mile S.W. lie St. Kitt's Quarries, producing excellent stone for building purposes. Population of the township, 1560.

BURG, a town of Prussian Saxony, on the Elbe, 15 miles N.E. from Magdeburg, on the railway to Berlin, is a busy manufacturing town of 15,877 inhabitants, most of whom are employed in the cloth and tobacco factories. The town came into the possession of Brandenburg in 1687, having previously belonged to the Querfurt principality. Its manufacturing prosperity dates from the arrival of French, Flemish, and Walloon refugees in the latter part of the sixteenth century.

BURGAGE TENURE denotes the particular feudal service or tenure of houses or tenements in ancient cities or boroughs. It is considered to be a species of socage, as the tenements are holden of the king or other lord, either by a certain annual pecuniary rent, or by some services relating to trade or handicraft, such as repairing the lord's buildings, providing the lord's gloves or spurs (Somner, "On Gavokind," 112-118). The incidents of this tenure, which prevailed in Normandy as well as in England, vary according to the particular customs of each borough.

Burgage tenure is supposed to have been the origin of the rights of voting for members of Parliament in cities and boroughs; and the great variety of those rights is in some measure accounted for by supposing them to be founded upon local customs. It is, however, impossible to trace the steps by which the irregular rights of voting in boroughs for members of Parliament, which were continued by the Reform Act (2 Will. IV. c. 45) until the extinction of existing interests, were derived from burgage tenure. In Scotland all tenements in royal burghs hold of the crown. The election of members of parliament is regulated by 2 & 3 Will. IV. c. 77, and 4 & 5 Will. IV. c. 86. The transmission of borough property is regulated by 10 & 11 Vict. c. 49.

BURGER, GOTTFRIED AUGUST, the son of a clergyman, was born near Halberstadt, in January, 1748. In 1768 he went to Göttingen, where his dissipation occasioned him much embarrassment, which was increased by an imprudent marriage. But he here formed an intimacy with Voss, Count Stolberg, Sprengel, and others, studied the classics earnestly, and Shakspeare among the moderns, and wrote some ballads which attracted considerable notice. After lingering some years in bad health and poverty, he died in 1794. He published two volumes of poems—"Bürger's Gedichte," 8vo, Göttingen, 1796—and a third volume in 1797, containing some specimens of translations from the *Iliad*, both in iambs and hexameter verse, with dissertations by the author. Bürger's ballads and romances have long been popular in Germany. His "Lenore" ("Leonora") and his "Wilde Jäger" ("Fierce Huntsman") have been, as well as some others of his poems,

translated into English, and afford a good specimen of his ballad style. His amatory poems are soft and pleasing. His language is easy and clear. He is one of the first German lyric poets, although Schiller has judged him somewhat severely.

BURGESS. See MUNICIPAL CORPORATIONS.

BURGLARY, in the criminal law of England, is the breaking and entering the dwelling-house of another in the night time with intent to commit a felony therein; or, being therein, stealing and breaking out. Breaking may be defined as a forcible irruption, whether made by picking a lock or opening it with a key, or by the unloosening of any fastening, as well as the actual breaking by means of tools, &c. The term night time has been defined by 1 Vict. c. 86, s. 4, as commencing at nine at night and concluding at six in the morning of the next day. If the breaking be in the day, and the entering at night, it is not a burglary; but this crime is committed when the breaking is committed on one night and the entering on another. While the term dwelling-house would exclude a distant barn, or an outhouse detached from the main building and not united by a covered passage, it includes any building either temporarily or permanently used as a dwelling house, and the crime may be committed though there is no one in the house at the time of the offence. Churches and places of public worship are also included, and to break into one of them at night with felonious intent is to commit burglary. The penalty attached to this crime by the statute 24 & 25 Vict. c. 96, is penal servitude for life, or not less than three years, or imprisonment for not more than two years with or without hard labour. By the 31 & 35 Vict. c. 112, s. 19, it is also provided that any person found by night armed with any dangerous weapon or instrument, with intent to break or enter any dwelling house or other building, or who shall be found at night provided with burglars' tools or with face blackened, masked, or disguised, with intent to commit a felony, shall be guilty of a misdemeanour punishable with imprisonment not exceeding three years for a first offence, or to a term of penal servitude not exceeding ten years for a second offence. Burglar had not always the special signification of night thief, though it from the first distinguished a thief who breaks into a house from one who robs on the highway. It is a French law term, and comes from *bourg*, a town, and *larcin* or *larron* (Latin, *latro*), a robber. Like many other such French law-words it passed early into common speech. Dogberry's "flat burglary!" is one of his most amusing blunders.

BURGMASSTER (*Bürgermeister*) is the title of the chief magistrate of a municipal town, answering to the English mayor. In the German free towns the burgermeister is the president of the executive council of the republic. This is also the case at Zurich, Basel, Schaffhausen, and some other Swiss cantons; while at Berne, Freyburg, and Lucerne the corresponding magistrate is called *schultheiss* (in French, *arogère*), and in the rest of the cantons *landamman*, a Swiss term. See AVOYER.

BURGOS, a city in Spain, capital of a province of the same name, formerly of the kingdom of Old Castile, and the seat of an archbishop, owes its origin to the erection of six *burgos* or hamlets on the banks of the Arlanzon, by a colony of Asturians in the time of Alfonso I. These were incorporated in the year 881 by Diego Perceles, who erected a castle on a hill on the right bank of the Arlanzon. As the Moors receded further to the south of Burgos, the higher parts of the town were abandoned for a lower situation; so that the *calle alta*, the street which is now the highest, was formerly the lowest of the city. In this street the leading patriots, Fernan Gonzalez and the Cid, who were born in Burgos, had their palaces. A triumphal arch in honour of the former hero, and the museum of the latter, mark the sites of those structures. Burgos shared for a long time with Toledo the honour of being

the residence of the Spanish monarchs, and was famous for its wealth, manufacture of woollens, and its commercial fairs; but when Charles V. transported the seat of royalty to Madrid its prosperity rapidly declined. The population then was 40,000; now it is about 25,000. Burgos is 134 miles N. from Madrid by railway. It is a large city, partly surrounded by ancient walls. Close to them flows the Arlanzon, which is crossed by three free-stone bridges leading to the suburbs, called *Vega*. Burgos has several beautiful promenades. Some of the streets are narrow and crooked, but others are wide and well built, especially that leading to the cathedral. In the middle of the city is a handsome square, in which there is a statue of Charles III. The cathedral is the finest Gothic structure in Spain, and one of the finest in Europe. It was begun in the thirteenth century by Bishop Maurice, an Englishman by tradition, and is built of white marble, of the same form as York Minster, and of about the same size as Glasgow Cathedral. The palace of Velasco, the new town-hall, and the theatre are the chief public buildings. There is also the nunnery of Las Huelgas, a mile from the city, where are the tombs of many of the early Castilian kings. The industry of Burgos is almost entirely confined to a few insignificant manufactures of paper and cloth, and the making of cream cheese from sheep's milk, which has a local reputation. It is believed that Burgos did not exist in the time of the Romans, from its not being mentioned by Ptolemy nor any other ancient geographer, its want of any ancient monuments, and its being insulated and out of the line of the ancient military roads. The castle of Burgos was the scene of the marriage of Edward I. to Eleanor of Castile. The town was attacked by the French, and sacked by them in 1808, after the Spaniards had been defeated by Marshal Soult. In 1812 it was four times attacked by Wellington without success, but surrendered to him the following year, when the French blew up the castle.

BURGOYNE, SIR JOHN FOX, was the son of the Right Hon. John Burgoyne, whose name was well known to the public in the latter part of the eighteenth century, not only as a public man, a member of Parliament, and a dramatic writer, but as the "best-abused" man of his day, in consequence of his having been compelled to surrender, with a British force, to the Americans. Little is known of the son's early history, except that he was educated at Eton, and at the military academy at Woolwich. In 1798 he entered the corps of the Royal Engineers, and served with great distinction in Sicily and Portugal, and afterwards with Wellington in Spain. From 1830 to 1845 he held the appointment of chairman of the Board of Public Works in Ireland; and by the engineering operations which he planned and carried out during that critical period he very considerably benefited the country. In 1845 he was appointed inspector-general of fortifications, and to him, whilst occupying this post, the Duke of Wellington addressed his celebrated letter on the defenceless state of Great Britain. In 1847 Sir John Burgoyne was appointed to conduct and organize the commission for the relief of the distress in Ireland caused by the famine. Of this commission he was the life and soul, and he laboured most diligently and perseveringly to render it more its efficiency.

On the outbreak of the Crimean War Sir John was appointed lieutenant-general on the staff, and to him was entrusted the leading of the forces. He also suggested the flank movement to the southern side of Sebastopol, and ultimately led the chief directions of the siege of that fortress. After the war he was advanced to the rank of full general, and subsequently to that of field-marshal. On the death of Lord Combermere he was appointed to the dignified office of Constable of the Tower of London, and was one of the active members of the National Relief Society, for aiding the sick and wounded in war. He enjoyed the most perfect health and strength until he had

long passed the age of fourscore years. The death of his only son, the commander of the ill-fated ship *Captain*, in September, 1870, was, however, a blow from which Sir John never recovered, and he died on 7th October, 1871. ("The Life and Correspondence of Field-Marshal Sir John Burgoyne," by the Hon. G. Wrottesley; London, 1873.)

BURGUNDY. This name, now so fixed and definite in its signification, has in the course of ages borne many meanings. Its primary meaning is the country conquered by the *Burgundii*, as France is the country conquered by the Franks, and England the country conquered by the Angles or English, &c. In neither case were the countries the original home of the race whose name they bear. The Burgundii, or Burgundiones, were a division of the Vandals or Goths, and when we first hear of them were occupying, in the reign of Valentinian (c. 374), the countries on either side of the Elbe, having been driven westwards from earlier settlements between the Oder and Vistula by the Gepidae, also a Gothic tribe. Valentinian was at this moment hard pressed in his great contest with the Alaric (not then the leading tribe of South Germany, and the source of the name *Albigens* for these countries); and since the Goths desired more secure settlements, and the emperor was in need of troops, a very large body of Burgundians joined the Roman army under cover of some hastily invented tale of their being descendants of the Roman armies of Drusus &c., who had occupied Germany under the first Caesars. By the year 400, or soon after, permanent settlements further to the west, along the frontiers of Gaul, were made; and the cities now called Geneva and Lyons were their chief places. The Burgundians became Catholics of the Arian faith, and during the progress of the fifth century were finally established, under a settled monarchy, on the Upper Rhine and both sides of the rivers Saône and Rhone. Their king, Gundiaric (Gutharik), had a furious conflict with Attila (Attila, king of the Huns, about the middle of the century, and was overthrown and slain; thus forms part of the historic basis for the *Nibelungen Lied*). In that wondrous epic it will be remembered that Worms, near the Elbe, not in its present position, but at some distance from the river, is the capital of the Kingdom of Burgundy. Towards the end of the fifth century the young Chlodwig, in modern German *Ludwig*, who is better known through the Latinized form of his name *Charles* (whence the French *Louis*), descended from the Frankish kingdom of his grandfather Meroving, situated in the countries lying round the deltas of the Scheldt, Meuse, and Rhine, and conquered for himself a fair domain in Gaul. His descendants, the first kings of France, were called the Merovingians or Merwings, from the name of the grandfather of Chlodwig. Up to 496 Chlodwig was a heathen; but in that year his queen, who was a Burgundian princess, converted him to Christianity; so that it is from Burgundy that France was converted. Chlodwig adopted the Arian-Christian creed, and one of his first acts was to make an expedition against his brother-in-law, who, on the ground of his Arianism, overran his domain, and levied upon him a heavy yearly tribute (499). Later, when the Frankish kingdom grew, the Burgundian declined. It was, indeed, incorporated with the Frankish kingdom in 534, but not its independent existence under a Frank prince, in 564. Finally it got split into two kingdoms (Provence or *Burgundy proper*, and Burgundy across the Jura and the *duchy*, the duke (877) being a Frankish vassal). In 938 Hugo Capet, count of Paris and virtual king of France, obtained the duchy of Burgundy, and it continued in the royal family of Capet till the death of the last of the first line in 1361, when by the failure of heirs it reverted to the crown. Meanwhile Rudolf, a nephew of Hugo Capet, had in 912 made him of a kingdom of Burgundy out of the northern part of the old kingdom; and his son, the King of Italy, in 925 added to this the

southern part. Eventually this new kingdom of Burgundy was bequeathed in 1032 by the childless Rudolf III. to the Emperor of Germany, and was merged in the empire. Of the other parts of the old kingdom, Provence was always held by French princes, and towards the close of the fifteenth century Louis XI. added this and the parts round Lyons, &c., amounting to a good half of the old kingdom, to the crown of France.

Turning back to the French duchy of Burgundy, which, as was said, reverted to the crown in 1361, it was given in 1363 by King John II., then the prisoner of the Black Prince in London, to his son Philip. This astute prince married in 1369 Margaret, heiress of Flanders (also a fief of France), and the great line of the Valois dukes of Burgundy rose to power. After Philip there reigned three dukes of his family—John the Fearless (1404), Philip the Good (1419), and Charles the Bold (1467). All these dukes were important French princes; but all at the same time added to their possessions from the neighbouring provinces of the German empire, and thus were at once vassals of the French king and the German emperor. In this way the whole of the present Holland and Belgium came to belong to them, and they were richer and more powerful than either of their lords. In the same manner as the crafty Louis XI. managed to win dominions for France from the old kingdom of Burgundy in the south, so also on the death and overthrow of Charles the Bold in 1477 did he set about securing the duchy of Burgundy. The Flemish possessions of the great duke, however, escaped him, as they went to Austria by the marriage of Charles' daughter with the Emperor Maximilian. [See CHARLES THE BOLD.] Beyond the later *kingdom* of Burgundy, absorbed into the empire in 1032, as was said, and the *duchy* of Burgundy, absorbed into the kingdom of France in 1479, there was also a *county* of Burgundy (better known perhaps under its later name of Franche Comté), of which Dôle was the capital. (Besançon and Vesoul are at present the chief towns.) The county of Burgundy occupied the place of the modern departments of Haute Saône, Jura, and Doubs, and a little beyond. Hugh the Black was the first Count of Burgundy (918), and his successors continued to rule until the marriage of the heiress, the Countess Beatrice, with the emperor. Frederick I. (Barbarossa) made the county of Burgundy a part of the German empire. Therefore the county of Burgundy, lying all along the west of Switzerland, became a German fief, while the duchy of Burgundy, to the west of it, lying between the rivers Saône and Loire for the most part, was always a French fief. This is the reason why, although Charles the Bold held both county and duchy by distinct inheritance, Louis XI. was only able to obtain the latter on his rival's overthrow; and why Mary of Burgundy was able to carry the county to Maximilian, along with Flanders, as her marriage portion. But the county of Burgundy, under the name of Franche Comté, remained an object of intense desire to France, and eventually Louis XIV. acquired it by conquest in 1668. The treaty of Aix-la-Chapelle enabled England, Holland, and Sweden to force him to disgorge his plunder the same year; but in the ensuing war he reconquered it, and it then became permanently a part of France, the treason of our Charles II. enabling Louis XIV. to extort the peace of Nimeguen from the betrayed allies of England (1678), and to gain, amongst his other advantages, this of the Franche Comté—the old county of Burgundy. The former duchy of Burgundy now comprises the departments of Côte-d'Or, Saône-et-Loire, Yonne, and part of Ain and Aube. The capital was Dijon. Burgundy is very fertile, and is particularly famous for its wines. See BRASSY, MAÏSON, &c.

BURGUNDY PITCH, a resinous exudation of the Norway spruce fir (*Abies excelsa*). It is obtained by making incisions in the bark, from which the resin flows

thickly and slowly, soon concreting into flakes which adhere firmly to the tress. It is afterwards melted in hot water, to free it from its volatile oil, and is cleansed by being strained through coarse cloths. When cold it forms an opaque substance, yellowish-white in colour, hard and brittle, with an aromatic odour and bitter taste. It is softened very readily by heat, and when warmed will stick firmly to the skin. In medicine it is used for making plasters of a mildly irritating character, either by itself or combined with other resins, oils, &c. It is seldom sold pure, and the substance usually sold as Burgundy pitch is a compound of resin and palm-oil. It is more friable and sticky, and has a different odour to the genuine resin.

BURIAL REGULATIONS. Before any person can be legally buried in England notice of death, with a medical certificate of the cause, must be given to a registrar, who in return gives a certificate of registration. When an inquest is held, the coroner sends the necessary information to the registrar, but, if necessary, he has power to make out an order for burial before the inquest is finished. Either a coroner's order or registrar's certificate must be delivered to the person who buries or performs any funeral service for the burial of the body of any deceased person. Any person performing such service without order or certificate must give notice to the registrar within seven days, or become liable to a penalty not exceeding £10. The laws relating to burial-places and modes of interment were all amended by the 20 & 21 Vict. c. 81, the 22 Vict. c. 1, the 23 & 24 Vict. c. 64, 25 & 26 Vict. c. 100, 34 & 35 Vict. c. 33, and lastly by the important Burial Laws Amendment Act of 1880. By the latter Act it was provided that any relative, friend, or legal representative being responsible for, or having charge of the burial of a deceased person, may give forty-eight hours' "notice of burial" to the rector, vicar, incumbent, or in his absence the officiating minister of any parish, that it is intended to bury such deceased person within the churchyard or graveyard of such parish without the performance of the Church of England burial service. The time of burial must be, except by mutual arrangement, between 10 a.m. and 6 p.m. between 1st April and 1st October, and between 10 a.m. and 3 p.m. between 1st October and 1st April. The person receiving such notice can object to the burial taking place on Sunday, Good Friday, and Christmas Day, by giving a reason in writing. Under this Act burials may be performed with a religious service or in silence, and it is required that due decency and order be maintained in either case. The person responsible for the burial must either, on that day or the day following, transmit a certificate of such burial to the rector, vicar, or responsible minister for registration. The same Act also allows more freedom to the clergy of the Church of England with regard to the burial service, and permits them to use it in any unconsecrated burial ground or cemetery.

BURKE, EDMUND, was born in Dublin, 1st January, 1730, o.s. His father, Richard Burke, or Bourke, a Protestant, and the son of a gentleman of landed property in the county of Cork, was an attorney in large practice.

Young Burke was first put to school at Castletown Roche, in the county of Cork, where he is supposed to have remained about five years. In May, 1741, he was sent to the classical academy at Ballitore, in the county of Kildare, which then enjoyed a very high reputation under the management of Abraham Shackleton, a Quaker of superior talents and learning. Here Burke remained for about three years, during which time he always considered that he had acquired the most valuable of his mental habits.

On leaving Ballitore Burke went, in April, 1744, to Trinity College, Dublin, and in 1751 proceeded A.M. Meantime, having been intended for the English bar, he had entered at the Middle Temple on the 23rd of April, 1747; and in 1750 he left Dublin for London.

Of his legal studies nothing is known with certainty, but it is believed that he became a writer in the newspapers and periodical publications almost immediately on his arrival in London. About 1755 he had formed the design of going to America, but he gave it up in compliance with the desire of his father.

His first separate literary work, so far as is known, appeared in 1756, in the form of an octavo pamphlet of 106 pages, entitled "A Vindication of Natural Society, or a View of the Miseries and Evils arising to Mankind from every species of Artificial Society, in a letter to Lord *** by a late Noble Writer." This is, especially for a young man of twenty-six, in all respects a very remarkable production. The imitation of the style and manner of Lord Bolingbroke, by whom the "Vindication" affects to be written, is so skillfully managed that when it first appeared, without the preface explaining the design which now introduces it, even some persons eminent in the literary world—Lord Chesterfield and Bishop Warburton among others—are said to have taken it for a genuine production. A few months after this pamphlet he published his "Philosophical Inquiry into the Origin of our Ideas of the Sublime and Beautiful," which he is said to have begun when he was only nineteen. It was well received by the public, and immediately brought the author into prominent notice. In this year Burke married the daughter of Dr. C. Nugent, of Bath. He soon afterwards engaged in the *Annual Register*, the first volume of which, for the year 1758, was published by Dodsley in June of the following year. See ANNUAL REGISTER.

Burke had now become very generally known in the literary and political circles of London, and numbered among his friends Garrick, Reynolds, Scam J. J. J., Lord Lyttelton, Warburton, Hume, and Dr. Johnson. Of his friendship with the latter, and their rivalry before friends for mastery in conversation, several interesting anecdotes are given in Boswell's "Life of Johnson." In 1759 he was introduced to Mr. William Gerard Hamilton, better remembered by the name of "Single-speech Hamilton." When Lord Halifax went over to Ireland as Lord Lieutenant, in 1761, Hamilton accompanied him as chief secretary, and took Burke with him as his private secretary. This connection, however, continued only for a year, as Burke thought Hamilton was too exacting.

When the Marquis of Rockingham was called to the head of affairs, in July, 1765, Burke was appointed to the situation of private secretary to the new premier. He then became member for Wendover; and, subordinate as was his nominal post, he may be said to have become immediately the animating spirit and chief moving power of this administration. The great question which the Rockingham administration was brought in to settle was that of the American Stamp Act; and the prudent and conciliatory measures adopted by the ministry, by which the rising storm in the colonies was at this time allayed, are understood to have been suggested and planned by Burke.

When Lord Rockingham and his colleagues were dismissed, on the 30th of July, 1766, Burke's pen was employed in producing a brief but pithy statement, under the title of "A Short Account of a late Short Administration." It is understood that Burke had the offer of a place in the administration of Lord Chatham, as well as from the Duke of Grafton, who succeeded Chatham in 1767; but he remained firm to the Rockingham party, which did not, however, go into decided opposition till the session of November, 1767. The Parliament was dissolved in March, 1768, when Burke was again returned for Wendover.

The following year appeared his first political pamphlet under the title of "Observations on a late State of the Nation." It is a remarkably able and vigorous performance, although presenting comparatively little of that splendour of imagination which distinguishes many of the

author's subsequent writings. The pamphlet on the State of the Nation was followed, in 1770, by the "Thoughts on the Cause of the Present Discontents," perhaps the most carefully finished and the most perfect, though not the most splendid, of all Burke's writings. In November, 1771, Burke was appointed to the situation of agent to the State of New York, the emoluments of which amounted to nearly £700 a year. In Parliament he continued to take a prominent part, particularly on American and East Indian subjects. On the dissolution of Parliament a few months afterwards, he was unexpectedly nominated for Bristol, contrived to reach the hustings on the sixth day of the polling, addressed the electors, and after a hard contest of twenty-seven days, he was returned, 3rd November, 1771. On moving in the House of Commons, 22nd March, 1775, a series of resolutions for conciliation with the American colonies, he delivered a speech of great eloquence and power, and took an active part in parliamentary proceedings generally. On 11th February, 1780, he submitted in the House of Commons his celebrated plan for the regulation of the affairs of the household, &c., and the admirable speech with which he introduced it was published, and is commonly known as his "Speech on Economical Reform." On the dissolution of Parliament, in the summer of the same year, he withdrew from the representation of Bristol, and was returned for Malden, for which borough he sat during the rest of his parliamentary life.

When the Rockingham party again came into power, in March, 1782, Burke was made a privy councillor, and appointed to the office of paymaster general of the forces. The office of paymaster had long been the most lucrative in the state, but he immediately brought in a bill for its reform, by which its enormous profits were completely swept away. On the death of the Marquis of Rockingham, in July, Burke resigned, along with Fox and the other friends of Lord Rockingham. The success of the celebrated coalition with Lord North, however, brought him back to his former office on the formation of the Duke of Portland's ministry in March, 1783. In this and the following session he took a leading part in the discussion of the affairs of India, and the Company's government of that territory—a vast and intricate subject, which he had long studied, and which he was universally admitted to understand better than any other man in Parliament. He powerfully supported Fox's India Bill, and when it was lost and the ministry defeated, Burke went out of office with the rest of his party, and was never again a member of the government.

For some years after this the affairs of India engaged his whole heart, and soul, and mind, and strength." His speech on 28th February, 1785, on the Nabob of Arcot's debts, and all his speeches in support of the charges against Warren Hastings, are among the finest of his productions; the latter extended over a period of many years, and have been published among his works. But, while he was yet in the heat of his exertions in this department, another great event suddenly called him off, which was destined to make the closing years of his life the most memorable and interesting of his political career. This was the progress of the Revolution in France. In a visit to Paris he had seen and felt what it rendered him apprehensive of the consequences of the doctrines propagated and the measures pursued by the National Assembly of France; and, in answer to a letter from a French gentleman in justification of them Burke wrote his "Reflections on the Revolution in France," which were published in the beginning of November, 1790. No political work, probably, was ever read with such avidity on its appearance. It is said that above 30,000 copies were sold before the first demand was satisfied. This pamphlet, and the opinions maintained by Burke in the House of Commons, led ultimately to

a complete separation from Fox and his party. The final contention in the House of Commons took place on the 6th May, 1791. In February, 1793, the war with France, which he had for some years predicted as inevitable, actually broke out.

Burke meanwhile continued his exertions, both with his pen and in Parliament, with as much vigour as ever. He wrote pamphlets on the Catholic Disabilities, the State of Affairs, and some others not published until after his death. But he was now anxious to retire from public life, and an arrangement having been made for his son to succeed him in the representation of Maldon, he only remained in Parliament to conclude the prosecution of Warren Hastings. Accordingly, the last day on which he appeared in the House of Commons was 20th June, 1791, when the thanks of the House were voted to the managers of the impeachment, for their faithful discharge of the trust reposed in them. Mr. Richard Burke, within a few days after his election for Maldon, was taken ill, and died on the 2nd of August, at the age of thirty-six. From this severe blow his father never recovered.

In October, 1795, he received a pension of £1200 per annum on the civil list, and soon after another of £2500 on the $\frac{1}{2}$ per cent. fund. An attack made upon him in the House of Lords, on the ground of this pension, by the Duke of Bedford and the Earl of Lauderdale, drew from him, early in 1796, his celebrated "Letter to a Noble Lord" (Earl Fitzwilliam), which was perhaps more generally read at the time, and has continued to be to a greater extent popularly known since, than anything else he ever wrote, with the single exception of the "Reflections on the French Revolution." Burke, having visited Bath for his health, returned thence in May to his house at Beaconsfield, in Buckinghamshire, where he died on the 9th of July, 1797.

The latest edition of Burke's works is that of the Clarendon Press. An excellent "Life of Burke," by James Prior, was published in London in 1826, and a very good biographical and critical sketch was prefixed to a collection of his works, by Dr. Henry Rogers (London, 1842). A later biography is that by Mr. J. Macknight (1858-60). See also Morley's "Edmund Burke, an Historical Study" (London, 1869).

BURKE, ROBERT O'HARA. See AUSTRALIA.

BUR'LEIGH, LORD, WILLIAM CECIL. was born at Bourne, in Lincolnshire, 13th September, 1520. His father was yeoman of the robes to Henry VIII. He was educated at Grantham, Stamford, and at St. John's College, Cambridge. At twenty-one he entered at Gray's Inn, and applied himself to the study of the law. In August, 1541, he married a sister of Sir John Cheke, who died in the second year of their marriage, leaving one son, Thomas, afterwards Earl of Exeter. In the same year he was introduced to Henry VIII., who, conceiving a favourable opinion of him, conferred upon him the reversion of the office of custos brevium in the Common Pleas (worth about £240 per annum). Shortly after the accession of Edward VI. Cecil married Mildred, daughter of Sir Anthony Cook, the director of the king's studies, which connection procured him the friendship of the lord protector Somerset. In 1547 he became member for Stamford, and the lord protector appointed him his master of requests, an office not only of distinction but of great trust. Cecil quickly acquired the confidence of the young king, and in 1550 was appointed secretary of state. On the fall of Somerset Cecil was imprisoned for a short time, but afterwards restored to his office and knighted. While secretary of state Cecil effected several important measures, one of which was the abolition of the exclusive privileges of the Merchants of the Steel-yard. He took no part in Northumberland's designs for altering the succession to the throne on the death of Edward VI., although he was induced

reluctantly to sign the instrument naming Lady Jane Grey heir to the crown. He gave in his adhesion to Mary, and received a pardon, though refusing to change his religion; he held no office during her reign, and as member for Lincolnshire even opposed some of the measures of the Catholic party. When Mary's death drew near Cecil opened a private correspondence with the Princess Elizabeth, and enabled her to avoid the snares of the suspicious queen. He was the first person sworn of the Privy Council in the new reign, and was forthwith appointed by Elizabeth secretary of state. From this time until the close of his life Cecil directed the affairs of England. In 1571 he was created Baron Burleigh (or Burghley); in 1572 he received the order of the Garter; and in the same year succeeded the Marquis of Winchester as lord high treasurer. He was also for many years chancellor of the University of Cambridge, and in 1593 became the first chancellor of the new University of Dublin. For forty years Lord Burleigh served the great queen as her most trusted and wisest adviser; his history is simply the history of the statesmanship of her reign. Possibly there never was a statesman of equal eminence who so completely effaced himself as Burleigh. Every act was his, but his reward was not in the popular applause; his own consciousness of successful efforts for his country and the warm friendship of Elizabeth sufficed. Burleigh's caution and gravity passed into a proverb, the witty Buckingham in the "Rehearsal" satirizing the grave, silent nod which he found in such dangerous times safer than speech; but the times of the Armada or of St. Bartholomew's Day found Burleigh as ready for prompt action as the rashest patriot of that patriotic era. He died at Burleigh House in the Strand 1598, and was buried at Stamford Baron in Northamptonshire, but a public funeral was at the same time performed in his honour in Westminster Abbey. From his son Thomas, earl of Exeter, has descended the present Exeter peerage, the earldom having been raised to a marquise in 1801. The courtesy title of the eldest son is spelt in the less usual manner, Burghley. From his son by a second marriage, Robert [see SALISBURY, EARL OF], whom James I. created Earl of Salisbury, the present Salisbury peerage has descended. The earldom of Salisbury was raised to a marquise in 1789.

BURLESQUE, a word derived from the Italian adjective *burlesco*, which is applied to quality words, gestures, or expressions of the countenance intended to excite laughter. The Italian verb *burlescere* means to mock or mimic, and also to laugh at a person and make him a dupe. The burlesque style is applicable to conversation and pantomime, and to written composition and the arts generally. The burlesque style, however, is most common in poetry, and may be defined to be a sort of good humoured satire. There is a class of burlesque poems in every language, such as "Hudibras" and "Beppo" in English; but of all modern languages the Italian abounds most in this species of composition, which is called *poesia burlesca* or *poesia giocosa*, and also *poesia Bernesca*. The burlesque in the art of drawing is shown in caricature, and frequently the sketches of low life and merry-making exhibited by many of the Dutch and Flemish painters almost amount to burlesque. Representations of deformed and uncomely figures fairly to be called burlesque are found among ancient and modern sculptures. In music the glorious burlesques of Beethoven in his symphonies, of Mozart, and of Haydn, are known to most lovers of the art. Perhaps the most successful of any is Mendelssohn's "Funeral March of the Clowns," in his "Midsummer Night's Dream" music, which rarely fails to elicit a peal of laughter when it is performed.

In the drama the word is used for a farcical dramatic piece interspersed with gay songs and dances, but the style lending itself to great abuse very readily, in incompetent or careless hands, it has sunk into disrepute with the

more cultivated managers and audience. During the third quarter of this century it was the most popular of all the species of dramatic entertainment.

BUR' LINGTON. See BRIDLINGTON.

BUR' LINGTON, a city and port of entry, in a county of the same name, New Jersey, United States, 16 miles N.E. of Philadelphia, is situated on the east bank of the Delaware, and has several churches, an episcopal college, city hall, lyceum, library, &c. Population, 7,237. The rise of Philadelphia has greatly affected its trade, though it still has a fair amount of commerce. Its original name was New Beverley. It was founded in 1667. Up to 1790 it was the seat of government to New Jersey.

BUR' LINGTON, a city and port of entry, the capital of Chittenden county in Vermont, United States, 38 miles W.N.W. from Montpelier, is on the shore of Lake Champlain. It is the largest and most commercial town in the state. It has good wharves and a lighthouse, and steam boats ply regularly to and from Whitehall and other places on the lake. The town is well built, and beautifully situated. It contains the state university, a medical school, library, court house, jail, and several churches. Population, 11,367.

BUR' LINGTON HOUSE (London) was erected in Piccadilly towards the end of the seventeenth century, by the second earl of Burlington, and was repaired and extended by the third earl, who built the colonnade. The house became the property of the Cavendish family in 1753, and the lease, which expired in 1802, was renewed. In spite of a special injunction in the bequest by which the property passed into the Cavendish family that it should not be pulled down, the work of demolition was carried into effect in 1867. The site is now occupied by the buildings for the Royal Academy of Arts and the University of London, and it also includes the apartments for the Royal Society, the Royal Astronomical Society, the Linnean Society, the Chemical Society, the Geological Society, and the Society of Antiquaries.

BUR MA, THE EMPIRE OF, at the time of our first war, 1824-26, comprised Burma proper, the principality of Mogaung, or Northern Shan states, Assam, Cachar, Manipur, Arakan, Pegu, and Tenasserim, and held territory to the Eastern or Burmese Shan states.

Growth of the Empire.—In 1754 Burma threw off the yoke of Pegu, which it had worn since 1719. It annexed Mogaung in 1755, Pegu in 1757, Tenasserim in 1759, Manipur in 1774, Cachar in 1774, Arakan in 1784, and Assam in 1818.

Disintegration of the Empire.—Arakan and Tenasserim were annexed by the English; and Assam, Cachar, and Manipur made independent in 1826. Pegu was declared part of the British dominions in 1852. Since then the Northern Shan states as far South as Mong Hsat in 25° 25' N. lat., the Burmese Shan states, and a portion of the country east of the Chindwin, or western branch of the Irrawaddy River, have refused to pay tribute, and are now practically free.

Boundaries.—Burma proper, otherwise called Upper Burma, and the portion remaining to it of the Northern Shan states, is bounded on the north by an irregular line crossing the Irrawaddy in lat. 25° 25', beyond which the country is composed of small table-lands, valleys, and hills, embraced by arms of the Tibetan plateau and inhabited chiefly by people of the Shan and Chingpaw, or Singpho, race. On the south it extends to lat. 19° 30' N., which separates it from the British province of Pegu. On the west is Manipur, and a narrow strip of Lushai country (inhabited by Chins, or Khyengs, and other cognate tribes) dividing Tipperah and Arakan from Burma. On the east lie the Kachhyen Hills, inhabited by Kachhyens and S'gais; and the Eastern or Burmese Shan states.

Physical Features.—The present kingdom of Burma

lies in the upper valley of the Irawaddi River. It is bounded on the west by the hilly table-lands, ranges, and valleys forming and bordering the Manipur plateau, and by the spurs of the Arakan Yoma Mountains; on the east lie the high hills forming the remains of the plateau of the Shan-Shwe-Pyee, with peaks of from 18,000 to 20,000 feet high, in lat. 28° , and a pass across them 8730 feet above sea-level, in lat. 25° , and the great mountain barrier, 5000 feet in height, which forms the western face of the Burmese Shan table-land.

Area.—Burma proper contains 43,000 square miles; and the portion of the Northern Shan country lying to the north of lat. 23, which is still partly tributary to and partly under the direct government of Upper Burma, 21,000 square miles. The gross area of the empire is now only 67,000 square miles. The portion of the Northern Shan country which has thrown off its yoke contains about 33,000 square miles, the Eastern Shan states 80,000 square miles, and the strip of now independent country on the west about 5000 square miles. The gross area of the Burmese empire since our annexation of Pegu has therefore diminished from 185,000 to 67,000 square miles, and the empire has shrunk into the dimensions of a petty principality.

Course.—The river Irawaddi has its sources in several streams rising in the lower Raka and two great arms of the Tibetan Plateau, about lat. 28° N. and between 97° and 99° E. long. It is navigable for rafts in the dry season as far north as Kado, in lat. 25° $20'$, where it is 1000 feet above sea-level; and for steamers all the year as far north as Blaung, in lat. 24° $16'$, long. 96° $8'$, where it is 430 feet above the sea. Between the junction of its great western branch, the Chin-dwaw, in lat. 24° $30'$, and the Burmese boundary, in lat. 25° $25'$, the river is joined by the Mogaung, Laping, Shwayh, Maiza, M'loa, Myit Ngé, Pambé, and Moa rivers, and other minor streams. The Chin-dwaw and Khyu-dwaw rivers in the Padoi and Shwé Dorengyo Hills. Just below the junction of the Oon river, in lat. 24° $38'$, there is a heavy fall, and goods have to be transhipped at this place into canoes for the carrying on of traffic in the higher reaches of the river; about lat. 24° $10'$ it is joined by the Monpur river; it falls to the eastern branch of the Irawaddi about lat. 24° $30'$. Below the junction of the main branches and the British boundary the Yan and other minor streams have their junction. There are three falls in the eastern branch between the mouths of the Mogaung and the Khyu-dwaw; the one above Blaung is in places only 240 feet broad, and boat traffic is impracticable during the floods, owing to the fierce rushing of the stream; the middle below Blaung is 970 feet broad at the narrowest; and the one above Ma-dalay is in places less than a quarter of a mile. The general width of the river varies from 1 to 3 miles.

Population.—No census having been taken in Burma proper, and very little of the country having been visited by Europeans, it is impossible to give a correct estimate of the population. It may be taken roughly as twenty-five persons to the square mile; this would give 1,675,000 for Burma proper, and 600,000 for the Northern Shan states, or a gross population of 1,675,000 inhabitants. Owing to the devastations which have raged for centuries over the whole of Upper China, and which were only put a stop to by our annexation of Burma, the population, which was once dense, has been terribly reduced. It consists chiefly of Burmese and Shan, but Khyengs, Kakhyens, Kathays, Yinnés, Yinnets, Yinnans, Karens, Palonges, and other tribes are met with, as well as Chinese and natives of India who have settled in the towns.

Ethnology.—The Burmese people are classed by ethnologists as Mongoloids. The numerous hill tribes—Karens, Khyengs, Kands, and others—belong to the same family as the Bhoite or people of Tibet. The connection from the one to the other, though their countries are so far apart,

may be traced by the similarity in the physical form and speech of tribes dwelling on the south-eastern border of the great plateau of Tibet, and bordering the way along the courses of rivers to the country of the middle Irawaddi.

Religion.—The religion of the Burmese, Shans, and Talaiings, as well as that of some of the hill tribes, is a mixture of Shamanism (the religion of their Tartar progenitors) and Buddhism. The religion of most of the hill tribes is either Shamanism, Shamanism with traces of the old snake worship, or a debased form of Shamanism.

Slavery.—The condition of slaves in Burma is very sad. Some are hereditary, such as those who are condemned to serve in pagodas. Others are bond slaves, who might obtain their liberty by paying their debts. The condition of outcasts is nearly as bad as that of the hereditary slaves, though it does not necessarily extend to their offspring. They include lepers and other incurables, executioners, who are generally pardoned malefactors; coffin-makers and others employed in the disposal of dead bodies, as well as of deformed and mutilated persons. They live apart from the masses; indeed, few people will hold any communication with them.

Dr. Anderson met many cases of slavery at and near Blaung, the slaves having been purchased from the Kakhyens, who, like the Red or Eastern Karens, are kidnappers. Upwards of 1200 souls are said to have been annually captured by the Red Karens and sold to the Zimmé Shans, by whom they are generally resold to the Siamese. We have been asked frequently by the White Karen chief of Western Karenice to take his country under our protection, or else to annex it, so as to stop the raids of the neighbouring man-stealers. If we had acceded to his request, and made representations to the King of Siam, this shameful traffic with Karenies would have been put a stop to long ago.

Education.—When a boy is eight or nine years old he is sent to a monastery and is taught to read and write, and when he is about twelve he is clothed with the yellow robe of the novice and made a *sheng*. The duties of a *sheng* are to minister to the wants of the *hpoongye* of the monastery. A portion of his time is occupied in learning to read, write, and cipher. The majority of these return to secular life after remaining some time in the monastery. A Burman who cannot at least write his name is seldom met with.

Towns.—Since 1740 the capital has been moved no less than eight times; it has been three times at Ava, twice at Amarapura, twice at Monchobo, and has been since 1857 fixed at Mandalay. Blaung is a narrow town a mile long, occupying a high prominence on the left bank of the Irawaddi. It is surrounded by a stockade 9 feet high. The population is about 2500. The plain between it and the hills is about 25 miles broad. Katha has about 200 houses. Tagaung and Old Pagan, two of the earlier capitals, are a mass of ruins; at the site of the former place there exists a small fishing village of forty houses. Mahé contains 300 houses, and is the customs post for clearing boats bound from Blaung to Mandalay; Schien-pagah, 100 houses. There is a gigantic pagoda at Mengoon. Mandalay is a square walled city, the sides being about a mile long. There are three gates on each side, and macadamized streets about 100 feet broad, leading from them, intersect the city. Between these there are small irregular streets and by-paths. The houses in the suburbs are similar to those in the other towns and villages along the river; they are simply frail structures of bamboo framework and mat covering, with grass or palm-leaf thatched roofs, and are raised some 4 or 5 feet from the ground upon wooden piles. In the principal streets the houses are of a better class, some even having brick walls. Many of the Chinese houses are two stories in height, and present a neat and tidy appearance. Numbers of pagodas and *kyoungs* are seen in all directions.

Amarapura is nearly a mile square, inclosed with walls

about 12 feet high, and has about 90,000 inhabitants. Taagaing is of large extent, and is inclosed by a massive decaying rampart. The interior space is but sparsely occupied by houses; the hills behind it are nearly covered with pagodas, temples and griffins, and long winding staircases; some of the latter are about half a mile in length. Ava suffered much from an earthquake in 1839; few relics remain of the city; the palace is gone; the streets are marked by ruins and by rows of fine trees that once formed boulevards. Myingyan is a large mart for rice. Koonjaiwa has about 1200 houses. The ruins of Pagan extend over an area of about 16 square miles. Yenangyoung is a large town, the centre of the petroleum trade. Magwé has about 3000 houses. Mengoon about 300 houses. Monhla is the frontier station, containing about 1000 houses. Besides the above there are many large towns and villages both along the river and in the interior.

Government. The king is an absolute monarch, having under him four and sometimes six *woongyees*, or principal officers of state, constituting a high court and council of the monarchy, termed the *Illwot-dan*—the designated crown prince, or some other prince specially appointed, being the president of this council. The *woongyees* have no special departments in the distribution of business, but deliberate together on whatever is brought before them; their decisions are recorded by clerks of the council, known as *tsaré-dan-gyees*, or by others called *than-dan-uns*. *Atwen-woons* are interior or household ministers who attend the king in turn (there are either four or six of these). Orders of the council are submitted by them to the king for approval, and they are the immediate recipients of the royal orders, though in rank they are inferior to the *woongyees*. Besides the cases adjudged by the *Illwot-dan* collectively, it has always been the custom for many suits to be referred to individual ministers at their own houses; and this used to be one of the chief sources of revenue to the *woongyees*. The *atwen-woons* transact the extensive business arising in the present reign out of the royal monopolies. The *woondouks* are the third order of ministers, and may be termed the assistants of the *woongyees*, with whom they sit in the *Illwot-dan*, though in an inferior position.

The country is generally divided into *myos* or districts, named after the chief town, and these are subdivided into circles or *taiks*; smaller subdivisions or village tracts being known as *gumas*. Each district has its own *myo-woon* or governor, under whom is a *myo-thoogyee*, whilst each *taik* has a *taik-thoogyee*, each village its own local official, and over small clusters of houses there are *goongs* or headmen. All, with the exception of these last, though really appointed solely for the collection of revenue, participate in the administration of justice, and share in the perquisites derivable under that head.

Taxation.—Princes, governors, and other principal officers are allowed to collect for their own benefit the taxes from specified villages or districts, and generally exercise an unbridled spirit of extortion. Lower chiefs have the profits of litigation for their support, to which they add the profits of shameless bribery. The meanest subordinates contrive to make their posts lucrative; even the keeper of a city gate expects additional fees for allowing persons to pass through with their common burdens.

The principal taxes are a poll tax of four and a half rupees and various taxes on agriculture, which are sometimes collected in kind at the rate of 10 per cent. on the produce. Duties are levied on salt, cotton, cutch, lead, timber, and rubies, and endless licenses are issued in the king's name, which add to his revenue. Besides these there is a regular tax on fisheries. Petroleum is a royal monopoly, as well as timber and precious stones. Since the beginning of 1881 the king has granted monopolies also for cotton, cutch, and pickled tea. There are taxes on ploughs, on brokerage, transit dues, dues on the sale of

cattle, various dues on produce of khad, dues levied from fishermen, &c. There are fees on lawsuits and criminal fines. Special remittances have to be made to the capital as presents from the *myo-ksa* and the local officials to the king at the commencement of each year, the cost of which is wrung from the people. Each tract has likewise to support the men who are annually called out to protect the frontier, or for warlike and other special purposes. The local officials receive no regular salary, but are paid by a portion of the fees and dues, and it is their interest to squeeze as much as they can or dare. Besides this, extraordinary contributions are called for by the crown on public emergencies. The gross taxation forms such a burden that it is no wonder that the population of British Burma has increased by the migration to it of 316,918 people born in Burma proper. The heavy taxation on all articles of trade entering or leaving the Shan states, together with the brutal and ceaseless oppression and greed of the officials, must have been one of the chief causes for the late successful rebellion of these states. The exactions and positive plunderings on the part of the Burmese officials at the numerous *kyns*, the demands for licensed brokerage, and other vexatious imposts, compelled the Shan traders to endeavour to dispose of their merchandise by stealth, as they were afraid to expose them in the public markets.

The treatment of these Shans by the Burmese rulers has all along been execrable. Lieutenant Sence, who crossed their country with the Salween expedition, says: "When we came to the Burmese outpost at the head of the Nattik (Nattik) Pass, we found it to consist of thirty men, stationed here principally to prevent the Shans from leaving their country without permission, which they would most certainly do if they had the opportunity, they so detest the Burmese rule. This is not to be wondered at, as there is no regular system of taxation. When the governor requires any money from a certain village, he sends out a body of troops to bring in so many tickals of silver from the farmers; and if this is not at once forthcoming the village is plundered and burnt. As the amount depends on the governor's requirements, they may be called upon at any time, and often more than once a year. So they are all in constant fear and have no inducement to acquire money; for if any man was known to possess any money, he would be at once come down upon for a large contribution. They would not all willingly come down into our territory, if they could; but such is the strict guard that is always kept at all the outlets (the Shan Mountains bounding the table-land facing Upper Burma are of mud limestone and other like precipitous rocks, which are so steep that there are only two or three places where they can be descended) that very few ever succeed in getting away, and these are generally single men, without family or relations. If they had any, and left them behind, they would most probably be tortured and kept inside the stockade as hostages until the man's return."

The land is all regarded as belonging to the crown, but any one may occupy as much of it as he pleases, and in any place not already held by another. He has only to inclose and cultivate it, and it is his. If the boundary be not maintained, or the inclosed space be for several successive years unimproved, it reverts to the king, and may be taken up by any other person. The king is supposed to own all the elephants in the kingdom, and has generally from 1000 to 2000 that have been caught and tamed.

Punishments.—The common punishment for minor offences are imprisonment, labour in chains, the stocks, and flogging; then follow flogging, branding, mutilation, slavery to Pagodas, and death. The incorrigible, when no longer able to pay fines, are tattooed with a circle on the cheek, or the name of the offence on their breast. Persons thus marked are deprived of civil rights, and become dead in law. Capital punishment seldom occurs, and almost exclusively

for murder, dacoity, and treason. It is inflicted by beheading, drowning, or crucifixion.

Justice.—The written code, civil and penal, though severe, is on the whole wise and good, but is little better than a dead letter. Rulers from the highest to the lowest decide causes according to their own judgment, or more frequently according to their own interest.

Commercial Treaty.—The commercial treaty between the government of India and Upper Burma signed in 1877. Since then many fruitless endeavours have been made to persuade the King of Burma to renew it, but owing to our refusal to enter a clause allowing him to import fire-arms, which would no doubt be used against us or in butchering his badly-armed neighbours, he has refused to comply with our wish.

Trade.—Monopolies, unstable government, and grinding oppression naturally operate to the serious detriment of trade in Burma. British enterprise, in the shape of the Irrawaddy Flotilla Company, with its headquarters at Rangoon, keeps up a regular service on the river by means of a magnificent fleet of steamers. The internal trade is principally in the hands of Burmese merchants, Parsees, and Chinese, but since Englishmen being established at Mandalay, the Burmese themselves are mostly devoted to agricultural pursuits, and though fairly keen as petty retail traders, they leave all the larger and more important branches of commerce to other hands. Burma exports rice, cotton and woollen goods, silk, salt, molasses, pickled and dried fish, tea, refined sugar, and numerous articles of foreign manufacture from British Burma, Borneo, the Andam Archipelago, and Langoon. Its chief exports are opium, native lacquer-ware, hides, catchfish, muslin, and cotton, raw sugar, grain, palm, and tamarind. The monopoly is granted by the king, from

strategic considerations, to the merchants of British Burma, and has consisted since 1824 of 100 tons of the oft-repeated deficiency of the effects of British influence and annexation. No complete law has yet been passed to the present time having regulated the export of goods. The exports from Upper Burma to British Borneo were valued at £2,000,880 in 1879, £1,996,630 in 1882, and £1,979,000 in 1883; the exports from British Burma to Upper Burma were valued at £1,775,191 in 1879, at £1,486,886 in 1882, and £1,899,000 in 1883. Consequently trade at one time existed between Burma and South China, and before 1855 was said to have exceeded £500,000 a year, being mainly carried on through the now important Siam State of Indochina. Both that is said and the Burmese rate have for several years been somewhat disturbed state that trade is almost wholly suspended, and it is not unlikely that the cotton which is said to be sent to China will be sent to British Burma. Owing to the opposition to the treatment of Christians and missionaries, the commerce of Upper Burma and the plantations of British Burma with the Shan States and the country of the hill tribes is greatly restricted. The advantage of the land route from an open trade route between South China, Western China and Tibet, and British Burma or Assam, has been pointed out by many experienced British officials, but the difficulties in the way are neither few nor small. Burmese rulers have always regarded with extreme suspicion any exploring parties under foreigners' flags, and regard them as a threat to their territory. Chinese influence is at the present time very strong in the Burmese capital, and has always been a hindrance to the attempts that have been made to open up a trade between British Burma and South China.

Money.—Burma has a currency modelled on that of British India, but the rupee coined by the king are of such base metal that they are only worth 1s. 1d. in the bazar, and the smaller coinage is equally debased. Indian rupees are current at all the river stations, and are gradually penetrating all the countries to the eastward. Indian

four-anna pieces are in great demand for buttons and other ornaments. The general interest on loans is often 60 per cent. with good security.

Weights and Measures:—

2 small ruays	= 1 large ruay, or 1 pice.
4 large ruays	= 1 bai, or 1 anna.
2 bais	= 1 moo, or 2 annas.
2 moos	= 1 mat (62½ grs. Troy).
1 mats	= 1 kyat - 1 tikal.
100 kyats	= 1 piakthah or viss (3½ lbs. avoirdupois).

Measures of Length:—

8 thits (finger-breadth)	= 1 maik (breadth of hand with thumb extended).
1½ marks	= 1 twah (span).
2 twahs	= 1 tounge (cubit).
4 tounes	= 1 lan (fathom).
7 tounes	= 1 tah (bamboo or rod).
110 tounes or 20 tahs	= 1 okethaph.
700 tounes or 100 tahs	= 1 taing (2 miles, 581 feet, 8 inches).
6100 tahs or 320 okethaphs	= 1 uxena, or about 12½ miles (a measure used in sacred books).

Measures of Capacity:—

2 Tunyets	= 1 lamay.
2 lamays	= 1 salay (about 1 pint).
4 salays	= 1 pyee (2 quarts).
2 pyees	= 1 sah (a gallon).
2 sahs	= 1 saik (a peck).
2 saiks	= 1 kwai.
2 kwais	= 1 ten (a basket measure).
100 tens	= 1 eagan.

Measures of Time.—The Burman year consists of twelve lunar months, making the year only 354 days long. To supply this deficiency a whole intercalary month is introduced every third year. The further rectifications which become necessary are made from time to time by royal proclamation at the instance of the astronomers.

The common era corresponds with our A.D. 639. The year commences about the middle of April; so that the 10th April, 1875, was the first of their year 1237.

In numbering the days of the month they go no higher than fifteen; that is, from new moon to full, and from full to new. They have four worship days in a month, namely, new and full moon, and half-way between them; so that there is an interval of seven days and sometimes of eight. Without any regard to this arrangement time is divided into exact weeks of seven days each. The days are called from the planets as ours are; thus, they name the first day of the week from the sun, the second from the moon, the third from Mars, the fourth from Mercury; fifth, Jupiter; sixth, Venus; seventh, Saturn.

Productions.—Rice, oil-seeds, sugar-cane, cotton, indigo, tobacco, catch, sesamum, tea, Indian corn, wheat, millet, and sugar from the Palmyra palm.

Fruit-trees.—Oranges, lime, mangoes, jack, papaya, guaves, cashew nuts, pine apples, plantains, custard-apples, sweet limes, citron, pomegranates, tamarind, jujube, shaddock, and many others.

Vegetables.—Sweet potatoes, yams, beans of several kinds, horse radish tree, wild asparagus, gourds, brinjal, tomatoes, okra, leeks, onions, chillies, mushrooms, and Chinese radishes.

Forests.—Teak, pine, pyngado, palouk, pyema, thitsee, eng, wild mango, and many other kinds. Bamboos grow to a height of from 80 to 100 feet, and the trees in the ever-green forest from 150 to 200 feet.

Minerals.—Coal, gold, copper, petroleum, salt, limestone, marble, &c. The districts where the amber, silver, lead, and jade mines exist are no longer tributary to Burma.

Geology.—Granite, gneiss, mica-schist, shales, sandstone, and limestone are the principal rocks met with.

Precious Stones.—The famous ruby and sapphire mines lie a little N.E. of Mandalay in lat. 23° 10', lon. 96° 30'.

Animals.—Gibbons, monkeys, lemurs, flying lemurs, frugivorous bats, the flying fox, insectivorous bats, jungle dogs, jackal, gray civet cat, common viverrine, tree cats, mungoose, tiger, pard, clouded leopard, fishing tiger cat, bay cat, leopard cat, common wild cat, otters, martens, weazels, badgers, Malayan black bear, tree shrew, hedgehog, musk shrew or musk rat, shrews, moles, the Irawaddi dolphin, elephant, flying squirrels, squirrels, rats, mice, porcupines, hares, wild boar, mouse deer, sambar, hog deer, brow-antlered deer, barking deer, wild goat, bison, gayal, wild cow, buffalo, tapirs, rhinoceroses, Malayan dugong, and the scaly ant-eater.

Birds.—There are 771 species of birds found in Burma. Of these about 450 are found on the Indian continent beyond the Brahmaputra. One hundred of these are water-birds, which are found over almost the whole extent of Europe, Asia, and Africa, and are nearly all winter visitors to Burma. Of the remaining 350 Indian species—all land birds—about 200 find their southern limit in Burma, about 100 range through Burma into the Malay peninsula, and about fifty extend laterally into China and Siam. The swallow, kestrel, barn owl, stone-chat, pipit, wagtail, cuckoo, sky-lark, snipe, plover, and other water-birds, are the same as in England. There are pea-fowl, jungle-fowl, pigeons, doves, pheasants, partridges, quail, hornbills, parrots, larks, honey-suckers, finches, crows, jays, magpies, tountits, vultures, adjutants, geese, ducks, teal, paddy-birds, &c.

Reptiles.—Crocodiles, tortoises, lizards, snakes, frogs, toads, newts, and waglars.

LOWER OR BRITISH BURMA consists of the three provinces of Pegu, Arakan, and Tenasserim. Arakan and Tenasserim were annexed to British India in 1826, and Pegu in 1852. The three provinces were amalgamated, and called British Burma, in 1862.

Boundaries.—The boundaries are—on the north, Chittagong, Upper Burma, and Karennee; on the south, the Gulf of Martaban and the Malay peninsula; on the west, the Indian Ocean and Chittagong; on the east, the crest of the Arakan Hills as far as the north boundary of Pegu, then the Siamese Shan states and Siam.

Physical Features.—Topographically considered, the province consists of four well-marked and distinct portions. In the west is a triangular strip of country, with the apex to the south; the north of the tract is a tangled mass of forest-clad mountains, the offshoots of the Arakan Yoma (Roma), drained by countless torrents which unite and reach the sea through one or two main rivers; towards the south and west it passes into rich alluvial plains, intersected by a network of tidal creeks, shut in on the east by the Arakan Mountains, which, as they gradually near the sea until they end at Pagoda Point, throw out wooded spurs and cross-spurs, filling the face of the country to the exclusion of the plains. These stretch out seaward in reefs and detached rocks, and thus render all approach to the iron-bound coast dangerous in the extreme to sea-going vessels. The greatest length of this tract is about 500 miles, and its breadth in the north about 100. The plain country contains some of the finest and most fertile portions of the province; from it are obtained the rice cargoes of all the vessels leaving Akyab. East of the Arakan Yoma are the valleys of the Irawaddi and of the Sittang (Tsit-toung); both narrow and mountainous in the north, they gradually widen; and a little to the north of Rangoon, the Pegu Yoma, the water parting between the two, ends, and they unite to form a vast alluvial plain, stretching southwards to the sea, and extending from the Arakan Yoma on the west to the Nat-toung and Martaban Hills on the east. North of the Kyauk-hto plain, the east cen-

tral portion of this tract, is a country in many respects similar to that in the north of Arakan, occupied by the Nat-toung or Pong-loung, and other parallel ranges of mountains and their spurs and cross-spurs, with ravines rather than valleys between them, drained by torrents which find their way seawards by the Beeling and Yonzaleen (Rwon za-leng) rivers; the whole is densely wooded and sparsely inhabited, chiefly by Karens, and with hardly any cultivation. Lastly, in the extreme east is a stretch of country bounded by the Salween and the sea on the west, and by the Dawna chain and main range on the east, about 47 miles broad at its broadest part, opposite Maulmain, generally level in the north, but with undulating ground here and there, and fantastic outcrops of caverned mural limestone ridges, starting suddenly from the plain, drained by three great rivers, the Salween, Gyne, and Attaran, and gradually narrowing towards the south, where the forest-clad offshoots from the high eastern chain fill the country, and convert it from fields of waving rice into a sea of forbidding mountains, with occasional plains, as along the valleys of the Tavoy and part of the Tenasserim rivers. To these may be added the Mergin Archipelago, a cluster of islands extending from the mouth of the Tavoy River to the extreme south, generally high and mountainous, and, with the exception of those which are mere rock, covered from their summits to the water's edge with rich and varied foliage, presenting a beautiful variety of scenery.

Area.—The approximate area of British Burma, according to the *British Burma Gazetteer*, is 88,566 square miles.

Rivers.—The delta of the Irawaddi River commences at Akouk-toung, 18° 30' N., and gradually spreading out increases in breadth to about 150 miles on the sea-board. The river within the British territory varies from three-quarters of a mile to 3 miles in breadth, and rises in places about 40 feet during the floods. Its first deltaic mouth, the Bassein or Nawoon River, is thrown off at Thambyadine, 17° 45' N., and has its mouth about 65 miles to the south of the town of Bassein. No other branches, with the exception of small lateral connections with the Hline River, occur above Yandoon, where the tidal flow is felt. At this place the Panlang Creek leaves the river for the Hline or Rangoon River, and steamers proceed *via* that creek to and from Rangoon throughout the rainy season. A few miles below Yandoon the delta commences to split up, and the country becomes intersected by numerous mouths and tidal creeks. The Irawaddi is embanked along its west side from Akouk-toung to the mouth of the Pantanaw Creek. The embankment is in three disjointed lengths; the Kyangyeen section is 6 miles in length, the Myanong 14½ miles, and the Henzadah 53 miles. An embankment, 70 miles in length, has been made along the east side of the Bassein River, joining the Henzadah embankment at Nawoon. The river discharges 2,040,123 cubic feet of water per second during the highest known floods, and 46,146 cubic feet when at its lowest stage. The silt carried in its waters past Myanong varies from 142.5 in the middle of August to 1,000,000 in the middle of April.

The river Salween has its sources in 32° 20' N., 83° 30' E., in the south-western corner of the great central table-land of Tibet, within 150 miles of the head-waters of the Indus, Ganges, and Brahmaputra. Proceeding nearly due east as far as 94° 10' E. it makes an S curve, whence it takes its course through a precipitous gorge-like valley, with ranges towering up on either side to 18,000 and 20,000 feet above the sea. After passing 28° N. the hills gradually lower, and there is a pass over them, in 25° N., 8730 feet above the sea. The river is spanned with a suspension bridge 420 feet long, the surface of the water at the bridge site being about 2500 feet above sea-level. The fall in the river-bed between 28° and 25° is believed to be about 3500 feet. At the Soo-Kat ferry, in 21° 56' N., the river in the dry weather is 210 feet wide, and at the

level of 1010 feet above the sea. At this place in August the flood rises 95 feet above the lowest level. Between the Soo-Kat and Ta-Caw ferries the river in one place is only 85 feet wide. At the Ta-Caw ferry it is about 750 feet and 870 feet above sea-level, the river rising from 40 to 50 feet in the floods. At our boundary in 18° 50' N. the river is 900 feet wide in dry weather, and about 200 feet above the sea. At the mouth of the Yemhineoung the river was measured by Dr. Richardson, who found its width to be only 250 feet. This is a little distance below the rope station, where a very strong cable of twisted rattans is stretched across a narrow part of the river to intercept the floating logs of teak after passing the Hatgyee or large rapid, which is the chief obstacle to the navigation of the Salween. The Salween is navigable in the dry season for boats as far as the rope station; there the timber from the Salween forests is claimed by the owners, rafted, and taken down to Kado, the government timber revenue station above Maulmain, where the duty is paid, and the timber cleared for export. Just above Maulmain the river is joined by the Attaran and the Gyne, after which it bifurcates, one mouth leading westwards into the Gulf of Martaban and the other southwards, emptying into the Indian Ocean, in 16° 5' N., 97° 35' E., opposite the town of Amherst. It is believed that shallow-draught steamers could ply as far north as Shwaygyeen, in 17° 12' N., but none have as yet been put on the river.

The Sittang (Tsit-toung or Pung-loung) has its western source in the Yemethon plain; the water parting is only 400 feet above the sea, in 20° 25' N., 96° 10' E. The eastern source rises in the hills a few miles to the eastward. The total length of the valley through which the river flows is about 350 miles, nearly half of which lies in Burmese territory. From the frontier towards Toungoo the banks are high and the country dry; there the hills recede, and an alluvial tract commences, extending in varying width towards the sea (the spurs in some places coming down to the river). The river throughout its course is tortuous, but especially so between Toungoo and Shwaygyeen; at the latter place it is 1540 feet wide, and at Sittang, where the tidal wave or bore generally dies away, about half a mile. The river empties into the Gulf of Martaban about 16° 50' N. The bore, although seldom exceeding 9 feet in height even at high spring tides in the centre of the river channel, comes dashing up the triangular-shaped mouth, with its three distinct wave-crests, swinging round the bends of the river like a liquid wedge, with an outside height of 15 feet, and passes up the river, gradually losing its head, at the rate of 12 miles an hour.

The other chief rivers of British Burma are the Hine or Rangoon River, Arakan, Bo-Eng, Attaran, Gyne, Layoy, and the Tanasserim.

Population.—In 1881 the population amounted to 3,539,771 souls, consisting of 2,766,827 Burmans and Taluangs, 518,291 Karens, 55,015 Chins, 35,554 Louchtons, 59,723 Shans, 27,598 other hill men, 246,289 natives of India, 12,962 Chinese, 11,860 Europeans and Eurasians. The population had increased 36 per cent. since 1872. It was found that 541,743 of the inhabitants were born outside the limits of the province, and that of these 316,018 were born in Upper Burma. The males were 52·28 per cent. of the population. The surplus of the men is chiefly due to the immigrant laborers. Amongst the Karens the females are 49·59 per cent., and the males 50·01; for all practical purposes the sexes may be said to be equal in numbers.

Condition of the People.—According to the most trustworthy statistics that can be obtained, of the 88,566 square miles of the province about 35,000 are cultivable, but only 4000 are actually under cultivation, although of the population 68·56 per cent. live by agriculture, and only 11 per cent. in towns. The amount of goods moving about the

country in boats, steamers, carts, on the railway or pack-bullocks, and on pedlars' backs, is surprising for so small a population. Besides the imports to and the exports from Upper Burma and Western China, British Burma exports and imports goods valued at from £7,000,000 to £8,000,000 per annum each. Barely 20 per cent. of Burman cultivators are in debt at all. The debt is often paid off after a single good harvest.

Education.—Considering the backward state of the people in many other respects, education shows up well, as 52 per cent. of the males over twelve years of age are able to read and write. In the country districts the monasteries are the only schools, much the same as in Upper Burma; but the Buddhist monks have accepted from the British government an improved system of elementary education which has many advantages over the native course of lessons which it superseded. A valuable series of schoolbooks have been prepared in the vernacular, setting forth the elements of geography, mathematics, astronomy, agriculture, human physiology, &c., and the use of these must of necessity do much in the way of removing the veil of ignorance from the native mind. In the large towns, and particularly in Rangoon, many fine institutions, both public and private, exist for the purpose of giving children of all creeds and races a sound Western education. They are principally conducted by missionaries or by masters appointed and controlled by the government, and in the case of the schools conducted by the former a considerable sum of money is spent annually by the government in grants-in-aid without regard to sect.

Religion. Eighty-seven per cent. are Buddhists; 3·8 per cent. Shamanists, or worshippers of nats or spirits; and 2·2 per cent., or 84,219, are Christians.

Houses.—The Burmans are, as a rule, comfortably housed. There are very few masonry houses outside the large seaport towns; most houses are of timber or of bamboos. They are built on piles, sometimes for health, sometimes on account of inundations, and in the wilder districts as a precaution against tigers. As the inundation in some places, especially on the east of the Martaban Hills, lies 12 or 14 feet on the ground, the necessity of this mode of building can be understood. In poorer parts of the country houses are built mainly of bamboos and thatch.

Towns.—In 1880 the population of the principal towns was:—Akyab, 33,989; Rangoon, 134,176; Prome, 28,813; Shwaydoug, 12,373; Pongday, 6727; Bassein, 28,147; Jundon, 12,673; Pantaw, 6171; Hengadali, 16,724; Kyau-green, 7,965; Myamoung, 5416; Thayetnyo, 16,097; Allamnyo, 5825; Maulmain, 53,107; Tavoy, 13,372; Mergui, 8633; Shwaygyeen, 7519; and that of Toungoo, 17,199.

Productions.—See BURMA, EMPIRE OF.

Fruit trees.—See BURMA, EMPIRE OF. Dorians and mangostines are also cultivated south of Maulmain.

Vegetables.—See BURMA, EMPIRE OF. English vegetables are likewise grown.

Forests.—At least 50,000 square miles of hill, valley, and plain in British Burma are covered with forests and woods of one kind or another. These forests yield ample supplies of timber, bamboos, and other products to the people of Burma. But to the world outside Burma the forests are chiefly known for the teak, timber, and cutch which they produce. The yearly average yield of teak is about 230,000 tons. Of this quantity, 110,000 tons, worth about £500,000, is exported. About one-fifth of the teak comes from forests in British Burma, and four-fifths from foreign forests on the upper waters of the Salween, Sittang, and Irrawaddy rivers. Though teak is the most valuable of the Burmese forests, still there are many other kinds of durable and valuable timber. The people build their houses mainly of such other timber. The iron-wood

(pyingado) and other trees yield large and durable house-posts and piles for timber bridges. The pyinma, thitka, karaway, padouk, and other trees furnish good scantling and planks.

Geology.—The geological structure of British Burma shows three sections, western, middle, and eastern, nearly corresponding to the provinces. The rocks of Tenasserim are of the Primary, Arakan of the Secondary, and Pegu of the Tertiary series.

BURMANNIACEÆ is an order of plants belonging to the class of **MONOCOTYLEDONS**. The members of this order are weak herbs, without leaves or with only a few scale-like leaves. They are natives of the tropics. The North American genus *Burmammia* and its nearest allies grow in damp, grassy soils, other genera in the shade of forests on decaying vegetable matter. The flowers have both stamens and pistil. The perianth is superior, coloured, of six divisions, in two whorls, the inner of which is composed of smaller leaves than the outer. There are three or six stamens, inserted on the perianth tube. The ovary has three stigmas, and one or three cells. The capsule is crowned by the marcescent perianth, and the minute seeds have a lax testa and an obscure undivided embryo. Benthams and Hooker include them in the series *Mitospermaeæ*. ("Genera Plantarum," iii., 2, 1883.)

BURNEL, ACTON, STATUTE OF. See **ACROS BURNEL**.

BURNES, SIR ALEXANDER, an eminent traveller and diplomatist, was born 16th May, 1805, at Montrose, in Scotland. His grandfather was the brother of William Burness, father of the poet Burns. Having obtained a cadetship in the Bombay army, Burnes left school at the age of sixteen, and arrived at Bombay 31st October, 1821. In December, 1822, he was appointed interpreter in Hindustanee to the first extra battalion at Surat; and on account of his proficiency in the Persian language the judges of the Sudder Adaulat appointed him, without solicitation, to the office of translator of the Persian documents of that court. His rise in the army also was rapid. In 1827 he was a lieutenant, and in 1828 assistant quartermaster-general to the army. In the meantime he had drawn up elaborate papers on the statistics of Wagur, and on the eastern mouths of the Indus. In September, 1829, he was appointed assistant to the political agent in Cutch, in prosecution of the survey of the north-west frontier. He soon afterwards made a journey into Rajputana, and in 1830 was appointed by the Indian government to proceed to Lahore. The details of this expedition are given in the third volume of his "Travels into Bokhara."

After his return from this mission Lieutenant Burnes proposed to Lord William Bentinck an expedition into Central Asia, which received from his lordship the most liberal encouragement. The sanction of the Indian government having been obtained, the journey was commenced in January, 1832. Lieutenant Burnes was accompanied by Mr. James Gerard, surgeon of the Bengal army, and was well provided with instruments; and made his journey a kind of flying survey. He returned in January, 1833, and the details of his journey were given in his "Travels into Bokhara," already mentioned. After a visit to England, where he was received in a most flattering manner by the Board of Control, Burnes was intrusted in 1836 with a mission to Dost Mohammed, at Cabul, primarily of a commercial nature. The mission left Bombay, 26th November, 1836, and reached Cabul 20th September, 1837.

He was knighted and made lieutenant colonel in 1838, and in 1839, as Sir Alexander Burnes, he proceeded from Scinde on a political mission into Baluchistan, in which, however, he failed. On the restoration of Shah Soojah to the throne, in September, 1839, he was appointed political resident at Cabul, in which office he continued till he was

murdered, 2nd November, 1841, with his brother, Lieutenant Charles Burnes, and others, on the breaking out of the insurrection in that city. See **AFGHANISTAN**.

Besides his "Travels into Bokhara" a narrative of his journey to Cabul was published after his death.

BURNET, GILBERT, Bishop of Salisbury, was born at Edinburgh on the 18th September, 1613. At the age of ten he was sent to college at Aberdeen, where he afterwards took his degree of M.A. He was licensed to preach according to the forms of the Scotch Church, in 1661, and soon acquired much reputation as a preacher. In 1665 he was appointed minister of the parish of Saltoun, in East Lothian, on which occasion he received ordination from the Bishop of Edinburgh. While here he also began his interference in affairs of church and state, by drawing up, in 1666, and circulating in manuscript, a strong representation against certain abuses of their authority which he imputed to the Scotch bishops. From 1668, when the administration of Scotland was put into the hands of Sir Robert Murray, and moderate counsels for a short time prevailed, Burnet, young as he was, began to be much consulted by those at the head of affairs. In 1669 he was chosen professor of divinity at Glasgow, and in the same year published his first work, entitled "A modest and free Conference between a Conformist and a Nonconformist." In 1672 he published a work somewhat differing in spirit from the generality of his productions, under the title of "A Vindication of the Authority, Constitution, and Laws of the Church and State of Scotland." In practical politics, however, he resisted all the attempts that were made to engage him in support of the oppressive measures of the court.

In 1674 he decided at last for his safety to resign his professorship and to remove to London. Here he was made preacher at the Rolls Chapel, and soon after he was elected lecturer at St. Clement's Dunes. In 1679 appeared the first folio volume of the "History of the Reformation in England." Overtures were made to him by the court, and he was offered the bishopric of Chester by the king, "if he would entirely come into his interest." He still, however, remained steady to his principles. About this time also he wrote a celebrated letter to Charles reproving him in the severest style both for his public misconduct and his private vices. His Majesty read it twice over, and then threw it into the fire. At the execution of Lord Russell in 1683, Burnet attended him on the scaffold, immediately after which he was dismissed both from his preachership at the Rolls and his lectureship at St. Clement's Dunes by order of the king.

On the accession of James II. Burnet retired to the Continent. Soon after his arrival in Holland he was introduced at the court of the Prince of Orange, with whom he became a great favourite. His active exertions in preparing the way for the accession of the prince to the English throne are matter of history. When William came over to this country Burnet accompanied him in quality of his chaplain, and immediately after the Revolution he was made Bishop of Salisbury. In 1698 he was appointed preceptor to the Duke of Gloucester, the son of the Princess Anne. The remainder of his life Bishop Burnet spent in his episcopal duties, his discharge of which was in every respect most meritorious and honourable. In 1699 appeared another of his most celebrated works, his "Exposition of the Thirty-nine Articles of the Church of England." Having lived to see the accession of the House of Hanover, the bishop died on the 17th of March, 1715.

The most remarkable of all his works appeared soon after his death, under the title of "Bishop Burnet's History of his Own Time, from the Restoration of King Charles II. to the conclusion of the Treaty of Peace at Utrecht in the reign of Queen Anne." Though derided by the Tory wits on its publication (the best parody being Pope's "Mœnias

of P. P. Clerk of this Parish"), the History is highly interesting, and has preserved accounts of many curious transactions which otherwise would have remained concealed from posterity.

BURNETT PRIZES. These are two theological prizes founded by Mr. Burnett of Duns, Aberdeenshire (born 1729, died 1784). This gentleman, who had accumulated a fortune by his success as a general merchant at Aberdeen, left the money at his death to be divided between charitable objects and these prizes. He directed the prize fund to be left for accumulation for periods of forty years, when two prizes not less than £1200 and £400 were to be offered for the two best essays on "the evidence that there is a Being all-powerful, wise, and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity, and this independently of revelation, and to point out necessary and useful inferences."

The competition is open to all the world, and the judges are three persons appointed by the trustees of the testator, the ministers of the Established Church in Aberdeen, and the principal and professors of Aberdeen University. The first competition was held in 1851, fifty essays being sent in, and the judges awarded the first prize of £1200 to Dr. William Lawrence Brown, principal of Marischal College Aberdeen, for his essay on the "Existence of a Supreme Creator." The second prize of £400 was awarded to the Rev. John Bird Sumner, afterwards Archbishop of Canterbury, for an essay entitled "Records of Creation." On the second competition in 1855, 208 essays were presented. The judges were the Rev. Baden Powell, Mr. Henry Rogers, and Mr. Isaac Taylor. The first prize of £1800 was awarded to the Rev. Robert Anchor Thompson, Lincolnshire, for his essay on "Christian Theism." Professor Tulloch, principal of St. Mary's College, St. Andrews, gaining the second prize of £600 for his essay on "Theism." These essays have all been published in accordance with the terms of the trust deed. If the fund is allowed to accumulate until 1895 it is said the amount of £10,000 will be available for prizes.

BURNEY, CHARLES, MUS. DOC., was born at Shrewsbury, in 1726. He studied music at his native city, at Chester, and then under Dr. Arne in London. He composed three musical pieces for Drury Lane Theatre, which were well received, after which he settled in London, and seriously entered on his professional career. Ill health obliging him to quit the metropolis, he accepted the situation of organist at Lynn, with a salary of £100, and resided in that town nine years. There he designed his great work, the "General History of Music."

In 1769 the University of Oxford conferred on him the degree of Doctor in Music. His primary object was his "History of Music;" and as he found that much of the materials for this could only be obtained by a personal examination of the great libraries of Europe, he visited the principal cities of the Continent, publishing so graphic an account of his tour that Dr. Johnson professedly imitated it in his "Tour to the Hebrides," as to which he expressly observed, "I had that clever dog Burney's Musical Tour in my eye." In 1774 Burney produced a "Plan for a Music School." The first volume of the "History of Music" appeared in 1776, the second in 1782, and the third and fourth in 1789. In 1796 he produced a "Life of Metastasio." His latest literary labours were his contributions to Ross' "Cyclopædia," for which he supplied all the musical articles, except those of a mathematical character. Burney's first volume and Hawkins' entire "History of Music" appeared in the same year. Burney's felicitous style, wealth of anecdote, and clearness of plan at once gained the public ear, but time has awarded the palm of accuracy and permanent value to Hawkins, whose labours his own age neglected. Burney was the friend of almost every literary person of distinction of his day, and it

is known that he contemplated writing his friend Johnson's biography. The last twenty-five years of his life he spent at Chelsea College, where he was appointed organist, and where he died in 1814 at the advanced age of eighty-eight, full of honours. His portrait by his friend Reynolds is one of the painter's fine works.

BURNEX, FANNY, daughter of the above. See D'ARBLAY, MADAME.

BURNHAM, a parish and market-town in the county of Somerset, on Bridgewater Bay, at the mouth of the river Brue, 146 miles from London. It is much resorted to as a watering-place, the sea air being held in high repute. The town is the terminus of the Somerset and Dorset Railway, and has a pier, from which steamers run to Cardiff and Swansea, on the opposite coast; a large hotel; a fine parish church; a market-house with town-hall, &c. Highbridge, 2 miles distant on the Bristol and Exeter Railway (where the Somerset and Dorset line effects a junction with it), is included in the parish of Burnham; it is a rapidly improving place, and has a commodious market-house and extensive railway works. Its cattle and cheese market is said to be the largest in the county. Population of the parish, 3615.

BURNLEY, a municipal and parliamentary borough in the county of Lancaster, 217½ miles from London, and 21 miles N. of Manchester, is situated on the banks of the Burn, near the confluence of that river with the Calder. The greater part of the town is well built, of freestone found in the neighbourhood. Both cotton and woollen manufactures are carried on extensively. The Leeds and Liverpool Canal, which nearly surrounds the town, opens a communication for the conveyance of goods through the whole line of country from the German Ocean to the Irish Sea. Coal and slate are abundant. There are also manufactures of machinery, iron and brass foundries, breweries, tanneries, and rope-works. The industrial prosperity of this town, which is chiefly owing to its water power and the abundant supplies of coal in the vicinity, has been greatly promoted by the Leeds and Liverpool Canal, already noticed, and by the easy railway communication with Blackburn, Bury, Manchester, and Liverpool. Several excellent churches and chapels have been erected, besides a neat building for the Church of England Institute, the library of which contains 6000 volumes. A market-hall was opened in 1868. It includes shops, stalls, galleries, a hall 180 feet long by 115 feet wide, and a clock-tower 90 feet high over the Doric portico. A free grammar-school has existed in the town since the Reformation. It is well endowed. Burnley was created a parliamentary borough in 1867, and was empowered to send one member to the House of Commons. It was unaffected by the Redistribution Act of 1885. The population in 1881 was 63,638, an increase of nearly 20,000 from 1871. The municipal government of Burnley consists of eight aldermen (including the mayor) and twenty-four councillors. From the relics found here, Burnley appears to have been a Roman station. Saxon remains have also been discovered at a place in the vicinity called "Saxefield," where, it is said, a battle was fought in 957. The name is derived from the river Brun, and it was formerly called "Brunley." Near Saxefield is an ancient cross, said to have been erected in memory of a visit of Paulinus to convert the inhabitants, where divine service was performed before the erection of the chapel. In the neighbourhood is the seat of the Townley family, many of whose monuments are in St. Peter's Church, and who are descended from an abbot of Whalley of the time of Alfred. The most notable member of the family was Charles Townley, Esq., the collector of the Greek and Roman sculptures called "the Townley Marbles," now in the British Museum.

BURNOUT, EUGÈNE, a distinguished French Orientalist, was born at Paris 1st April, 1801, and was the son

of J. L. Burnouf, professor of rhetoric at Paris and member of the Asiatic Society of that city. Early in life he devoted himself to the study of Eastern languages, one of the first results of which was an essay on the Pali language, which he published in conjunction with Professor Lassen in 1826. He next devoted his attention to the Zend or ancient Persian language, which had previously been sealed to European scholars; and of this he succeeded in discovering the key. He deciphered and published certain MSS. in that language, which had been brought to Paris by Anquetil du Perron, the first work being the *Vendidad-Sadé* of Zoroaster, which was commenced in 1830. In 1834 the first part appeared of his "*Commentaires sur le Yaçna, l'un des Livres Liturgiques des Perses*," a work which opened up to European scholars the teachings and language of Zoroaster. In 1840 he began the publication of the Sanskrit text, with a French translation, of the *Bhāgavat Purāna*, a system of Indian mythology and tradition. At this time he commenced a study of the sacred books of the Buddhists, which had been discovered by Mr. B. Hodgson; and after six years' labour produced his great work, the "*Introduction à la Histoire du Bouddhisme*," in 1845. While still pursuing his studies with unabated vigour he was overtaken by death, 28th May, 1852, leaving behind him a world-wide reputation for profound and brilliant scholarship.

BURNS and SCALDS. Burns are produced by heated solids; scalds, by heated fluids. The severity of the injury is dependent mainly on the intensity of the heat of the burning body. Fluids are not capable of acquiring so high a degree of temperature as some solids; hence the immediate effect of scalds is generally less violent than that of burns. But, on the other hand, fluids flow about with great facility, and the accident often causes a very large surface of the fluid to be thrown upon the body, so that a scald which produces only a moderate degree of inflammation sometimes becomes exceedingly severe on account of its extent. The worst burns which occur arise from the explosion of gunpowder, of inflammable gases, or from the female dress catching fire; and the worst scalds from the boiling over of heated fluids in breweries, manufactories, laboratories, &c.

Since the severity of the injury must always be mainly in proportion to the length of time the burning body continues in contact with the skin, it is important that every one should impress upon his mind the course which it is best to take in case of accidents from burns.

The upright posture is obviously not only favourable to the spreading of the flames, but to their reaching the more important parts of the body, the neck and head. Any motion of the body to and fro gives great advantage to the flames, by bringing fresh currents of air into contact with the burning materials, and it is therefore utterly absurd to run screaming about. Fall upon the floor; keep rolling over and over upon the carpet; if possible seize the hearth-rug or the table-cover, and, enveloping the body in it, keep rolling about upon the carpet until assistance comes. The duty of the assistant is to seize the hearth-rug, or the table-cover, or a shawl, or to strip himself of his coat, or to seize any woollen or flannel clothing at hand, and to envelop in it as closely and completely as possible the person on fire. It has been recommended that all the clothes of children should be dipped in a weak solution of nitre before they are worn, which would prevent their blazing if they caught fire.

The thing to be done with the burned or scalded parts is instantly to immerse them in cold water—ice-cold if it can be got. Should the position of the parts not allow of their immersion in water, cloths should be applied to them dipped in water, and kept constantly wet. As a means of applying and retaining cold, scraped potatoes or turnips are useful. As a local application few things are better than Carron-oil, which consists of equal parts of olive-oil

and lime-water. It should be well shaken before using, and may be poured on the injured part, which should then be covered with old linen or cotton wool moistened with the same application. When blisters form, the moisture in them should be got rid of by pricking them with a needle or sharp pair of small scissors, and covering the skin with a pad of cotton wool. Where the pain is very great opium and chloroform are useful, but for the administration of these skilled medical attendance is requisite. When the shock causes pallor and a feeling of cold, warmth and the exhibition of stimulants are required, and children may be immersed in a warm bath for the same purpose. Great attention must be paid to the healing of sores caused by burns or scalds, as if they are carelessly or improperly treated the skin will become puckered and unsightly, or even serious deformities may result.

BURNS, ROBERT, was born on the 25th of January, 1759. As the poet himself phrases it, with an allusion to the close of George II.'s reign in 1760—

"Our monarch's hindmost year but one
Was five and twenty days begun,
'Twas then a blast o' Janwar' win'
Blow hansom in on Robin."

The few lines which can here be devoted to recording the bare facts of the poet's uneventful life are not and cannot be taken as any measure of the grandeur of his extraordinary genius. The true life of Burns was lived in his emotions, and is depicted in his poems. To think of him as a disappointed exorceman is nothing short of a profanation; and indeed no man with any love for noble thoughts, with any taste for artistic expression, or with any reverence for that divine afflatus which in his best moments moves him to awe and wonder by the mystery of its origin and its power, can help a throbbing indignation passing over him when he is forced to contemplate the sordid facts of an unhappy life in connection with him whom, even in his lifetime, Scotland honoured, and whose memory is guarded with a sacred affection. It is with Burns in his later days as with Beethoven, the fickle public which floats on the surface of the world had turned its worthless admiration to others, but the great soul of the true art public beat warmly with the master. Had only Burns' condition been better known he might have been a happy man; but, alas! he "fell among thieves," and his life was played with as a toy, and thrown aside, broken, to perish.

The conditions and limitations of this work precluding the proper consideration of Burns' life (since the facts are utterly misleading, and would represent one of the purest minds ever unhappily besmirked by foul circumstance as almost a libertine and a drunkard), the reader is earnestly referred to some such sketch as that in Thomas Carlyle's "*Miscellanies*," where Burns may take his true rank as the greatest soul of his century, and as the greatest that Scotland ever produced. Severely, almost too severely, does Carlyle judge the poet's many errors; but his appreciation of his true rank is thorough and ungrudging.

The main outward facts of poor Burns' life are these:—His father, William Burness, was the son of a farmer in Kincardineshire, but left that part of Scotland in his youth to seek employment in the south as a gardener. In 1757 he took a perpetual lease of seven acres of land, near the Bridge of Doon, about 2 miles from the town of Ayr, and built with his own hands the humble clay dwelling in which Robert, his eldest son, was born.

The history of the poet's early life has been very fully related both by himself and by his brother Gilbert. The life of William Burness was one continued struggle, which he carried on with the honourable pride common among his countrymen, endeavouring to better his circumstances, and to give his children a good education. Robert obtained a little school instruction by snatches, but the amount altogether was very inconsiderable. In 1784 William Burness

died, worn out with toil and sorrow. He left five children younger than Robert and Gilbert.

In these circumstances the youth and early manhood of the future poet were dark enough. "The cheerless gloom of a hermit," he says himself, "with the unceasing toil of a galley-slave, brought me to my sixteenth year." Some time before their father's death, and when his affairs were drawing to a crisis, the two brothers had taken a farm, which they stocked in the best way they could with the savings of the whole family.

A little before his sixteenth year, as he tells us himself, Robert had "first committed the sin of rhyme." His verses soon acquired him considerable village fame. He published his poems in the autumn of 1786. They were well received by the public; and after paying all expenses the author cleared nearly £20. He was setting out for Jamaica to push his fortune, when, he tells us, "a letter from Dr. Blacklock to a friend of mine overthrew all my schemes, by opening new prospects to my poetic ambition. The doctor belonged to a set of critics for whose applause I had not dared to hope. His opinion that I would meet with encouragement in Edinburgh for a second edition fired me so much that away I posted for that city, without a single publication or a single letter of introduction." The result was the introduction of the poet to all who were eminent in literature, in rank, or in fashion in the Scottish metropolis. A new edition of his poems was published, from the profits of which he received nearly £500. In 1788 he took up his abode at the farm of Ellisland in Dumfriesshire, which he stocked with part of the profits of his poems. The speculation failed.

Soon after this he was appointed an officer of excise for the district in which he lived. The salary which he received in this capacity was originally £50 a year, but was eventually increased to £70. About the end of the year 1791 he retired with his family to a small house in the town of Dumfries. Here Burns spent the short remainder of his life. The prospects upon which he had placed his reliance of advancement in the excise were suddenly overcast, and with small wonder, for amongst many other impudences Burns sent a few caricatures, which he purchased for £3, to the revolutionary Convention which then ruled France. He did he was with difficulty saved by friends from dismissal. In health and great dejection of spirits at last came upon him, along with the pressure of accumulating pecuniary difficulties. He died 21st July, 1796. That Burns sought to "draw his sorrows in the bowl" must be with pain admitted, but indeavour his exaggerated fault, and not considered his temptations; also, that other grave irregularities occur in his life cannot be truthfully ignored or passed by, but his own poems show few but his indiscretions were lamented, and they were as far as might be repaired.

The history of literature scarcely affords another instance of a popularity either so sudden or so complete as that obtained by the poetry of Burns. Even in his own lifetime, and indeed almost immediately after his genius first burst into public notice, his name and his poems were familiar to all ranks of his countrymen. Nor did the enthusiasm for his poetry die away with the generation among whom it was first kindled. His works are still everywhere a cottage book in his own land, and they are read wherever the English language is understood. The most recent and complete collections of Burns' works are those edited by W. Scott Douglas and Rev. George Gilliland respectively.

BURNT-EAR, in corn, is a disease in which the fructification of the plant is destroyed, and, as it were, burnt up. Burnt-ear has often been confounded with smut, though a distinct disease. In the burnt ear the black powder appearing in the ear is external, and the grain has either never been formed or its coat has been destroyed, so that the whole ear appears black or burnt. The powder

also has no smell, and being easily blown away by the wind, or shaken off in the reaping, little of it adheres to the corn or is mixed with it when ground; and except the loss of so much grain as would have been contained in the sound ears, no great detriment arises to the quality of the corn. The smut or pepper-brand, on the contrary, is contained in the body of the grain, which retains nearly its natural form, and is carried along with it into the barn. It is only in the threshing or grinding that the diseased grain, commonly called smut-ball, is broken, when a fetid black powder is dispersed over the sound grain, which greatly deteriorates the flour, and renders the corn unfit for seed. Microscopic observations show that the black powder consists of the minute germs or sporules of a parasitical fungus, which are developed in the growing ears, and live on its substance.

De Candolle has named this minute fungus the *Uredo carbo*, which he distinguishes from that which produces the smut, and which he calls *Uredo caries*. They are easily distinguished by the size and smell. The *Uredo carbo* is composed of much smaller sporules, and is destitute of smell; both are propagated by their minute spores, which are carried along with the sap into the circulation, and vegetate in the ear, where alone it appears that they find the conditions necessary to their growth.

The best preservative against this disease is to drain the land well and keep it in good heart, so that the plants may be vigorous and able to resist the attacks of the parasite; for it is a well known fact that weak plants, as well as animals, are much more exposed to the attacks of parasitical plants or animals than those which are vigorous and robust. A judicious change of crops, or a well-established rotation, will in general secure the corn which is sown in its proper course from the infection of the *Uredo carbo*, if the preparation of the land has been such as to insure a healthy vegetation.

BURNTISLAND, a parliamentary and royal burgh in the county of Fife, situated on the Frith of Forth, and included in the Kirkcaldy district. It is 5 miles from Kirkcaldy, and 107 from London by the Great Northern and North British Railways. It is clean and well built, has the best harbour on the north side of the frith, with a pier, a dry dock, and a lighthouse. It is the steamboat ferry station on the route from Edinburgh to Fifeshire. The trade has much increased of late years, and in addition to the herring fishery and curing, which were always important, there is now a good business in the export of coal and iron. There are also some cooperages and a distillery in the town, and limestone is quarried in the neighbourhood. Burntisland is resorted to by many Edinburgh citizens for its sea bathing and fine golf links. Population of parish, 1271. Burntisland unites with Kinghorn, Dysart, and Kirkcaldy in sending a member to the House of Commons. It is said to have derived its name from some vitrified rocks near it. In 1601 the General Assembly met here, when James V. renewed his vows as a Covenanter. The existing quays were built by Cromwell. About 3 miles from Burntisland is the village of Aberdour, with its interesting old castle and ancient Norman church.

BURNT-OFFERING, one of the most ancient and most widely spread of the methods of presenting a sacrifice in worship. The transforming power of fire must have been observed very early in the history of the race, and when offerings were made to the deities by its means the flame and smoke and the odour of the sacrifice were supposed to ascend to them. A curious reference to this belief is to be found in the account of the sacrifice offered by Noah (Gen. viii. 21). Sacred herbs or their juices, wine, blood, and portions or whole carcases of animals were offered by means of fire. Among the ancient Jews a portion of every sacrifice dedicated to Jehovah was burnt upon the altar, while in certain specified sacrifices the whole of the animal offered was

consumed in this way. By the books of the Law burnt-offerings were required to be offered every morning and evening, with additional sacrifices for the Sabbath, at the new moon, on the occasion of the passover, the feast of tabernacles, the feast of trumpets, and on the Great Day of Atonement (Num. xxviii. and xxix.) In addition to these public services there were also numerous occasions specified when private burnt-offerings should be offered, and free will offerings to the Lord might be made in this way at any time. See also SACRIFICE.

BURR or **BUHR STONE** is a hard siliceous rock which is much used for millstones. It is extensively quarried from the fresh-water Tertiaries of the Paris basin, where it has a cream colour and vesicular structure. It is also found in the Eocene of South America.

BURRHEL or **NAHOOR** (*Ovis burrheli*) is a SHEEP found in India, on the main chain of the Himalayas. According to Dr. Jerdon it is found from Sikkim nearly to Simla, but does not extend further west than the valley of the Sutlej. It occurs only at great elevations, in summer generally keeping to the tops of the hills, and even in winter seldom descending below the forests. The burrhel, a specimen of which may be seen in the London Zoological Gardens, stands about 3 feet high at the shoulder. From the general colour of its fleece it is often called the "blue-white sheep." The belly is white, the front of the legs and chest black. In the male the horns are very long, and diverge considerably from the base. It has no beard. The burrhel associates in flocks, from fifty to a hundred being often seen together. It is a favourite object of chase to adventurous sportsmen.

BURROWING OWL (*Athene cunicularia*) is an Owl, distributed over a great extent of country in America, from the prairies of the Mississippi to Chili and Coquimbo, and found also in the West Indian Islands. Wherever it occurs it dwells, at all events during the breeding season, in burrows formed in the earth either by its own labour or by that of some digging mammal. At the bottom of its burrow the eggs are deposited on a bed of moss, grass, and dry roots; and here the young remain during the downy period of their existence, occasionally advancing to the entrance, but retreating immediately on the approach of any suspicious object. In the western prairies of the United States the burrowing owl is a constant inhabitant of the villages formed by the habitations of the prairie dog or marmot, living on good terms with the true owners. In fact the mode in which the marmots sport about near the entrances of their burrows, whilst the owls move briskly amongst them, is said to furnish a most delightful and amusing spectacle. It is singular that the cry of this bird resembles that of the prairie dog, which consists of the syllables *chek-chek* pronounced several times in rapid succession, and that this note is also common to the individuals inhabiting the West Indies and other parts of America where no prairie-dogs occur. From the pellets of indigestible food which these owls, like all other birds of prey, cast up, it has been proved beyond doubt that their food consists wholly of insects. In South America and the West Indies, however, they prey not only upon insects but also upon rats, mice, and reptiles. Darwin, during his voyage in the *Beagle*, had the opportunity of observing the habits of the burrowing owls in South America. "During the open day, but more especially in the evening," he says, "these birds may be seen in every direction, standing frequently by pairs on the hillocks, near their burrows. If disturbed they either enter the hole, or, uttering a shrill harsh cry, move with a remarkably undulatory flight to a short distance, and then, turning round, steadily gaze at their pursuer. Occasionally in the evening they may be heard hooting. I found in the stomachs of two which I opened the remains of mice, and I one day saw a small snake killed and carried away.

It is said that these little animals are their common prey during the daytime. I may here mention, as showing on what various kinds of food owls subsist, that a species which was killed among the islets of the Chonos Archipelago had its stomach full of good-sized crabs."

The burrowing owl is a small species, measuring between 9 and 10 inches in length. The plumage above is of a light amber-brown, with whitish spots; the under side is whitish, with brown bands on the breast.

BURSARY (Lat. *bursa*, Fr. *bourse*, Ital. *borsa*, a purse), the annual proceed of a capital sum, or of landed or other property, bequeathed for the maintenance of a student at a university. The term is not used in England, where such sums are termed scholarships, though college treasurers are usually called bursars. In Scotland each of the four universities possesses numerous bursaries, some of which are presentative, or restricted to persons of a certain district or family name, but most of which are open for competition.

BURSERACEÆ, an order of POLYPETALÆ consisting of balsamic, resinous, or gummy plants with pinnated leaves, and the general appearance of orange trees, but differing in the fruit forming a shell, which in the ripe state splits off in valves. They are natives of the tropics.

Bursera is the genus which gives the name to the order. The Guiana "cedar wood" is the product of *Iceia altissima*. A single tree of this species supplied Sir R. Schomburgk with a canoe 12 feet long and 3½ feet wide. The wood is light and easily worked; it is valuable in tropical countries for interior fittings, as its aromatic smell keeps off insects. The Nubians make paper from the inner bark of a native species of Amyris. Amongst the genera may also be mentioned BAUSA MODI STROX, BOSWELLIA, and CANARIUM. Myrrh, frankincense, olibanum, balsam of Acouch, gum-clemi, balm of Gilead, and opobalsamum, or balsam of Mecca, are all products of different species of the order. The order Burseraceæ belongs to the cohort Geraniales. The calyx has three or five divisions. The disc is ring like or cup-shaped. The ovary is not lobed, and has two to five cells, with two pendulous ovules in each. The embryo is without albumen, and the cotyledons are twisted back upon themselves.

BURSLEM, one of the oldest market towns in the Pottery district, in the county of Stafford, 3 miles N. by E. from Newcastle-under-Lyme and 151 miles N.W. of London, on the Trent and Mersey Canal and North Staffordshire Railway. The town stands on a gentle eminence, the four principal streets are well laid out, and the houses generally well built. The china and earthenware manufactures are carried on very extensively, the town being surrounded with an abundance of coal and suitable clay. There is also a glass manufactory. The parish church has an ancient embattled tower. There are several other churches and several denominational chapels. The other principal buildings are a market-house and town-hall, built in 1865, the Wedgwood Memorial Institute, commenced in 1863 and opened in 1869. The building is used as a school of art, free library, and museum, but its special character is given to it by making terra-cotta and ceramic enrichment the main feature of the façade, constructively, and not merely as surface decoration. This gives a thoroughly local and unique character to the edifice, and its success proved the feasibility of this novel kind of ornament. As early as the seventeenth century Burslem was the chief place in England for the manufacture of earthenware. At first the productions were of a homely kind, but they were subsequently brought to great perfection by Josiah Wedgwood, "the father of English pottery," who was born in the town in 1730. Burslem was formerly a chapelry in the parish of Stoke, but was constituted into a parish in 1807. It still forms part of the parliamentary borough. The municipality consists of

four aldermen and twelve councillors, one of whom is also mayor. The population of the municipal borough in 1881 was computed at 26,522, and that of the parish at 28,249. In Domesday Book this town is written *Burcardeslun*.

BURTON, JOHN HILL, LL.D., advocate and author of numerous valuable historical and biographical works, was born at Aberdeen, 22nd August, 1809. He lost his father in early youth, and owed his education at Marischal College to the prudence with which his mother managed her somewhat scanty resources. Having taken his degree of M.A., he was apprenticed to a legal practitioner in Aberdeen, but afterwards went to Edinburgh, where he became a member of the Scottish bar in 1831. The leisure which a young advocate usually enjoys he devoted to the study of law, history, and political economy, and became a regular contributor to the *Westminster Review*, *Edinburgh Review*, and *Blackwood's Magazine*. In the department of law he published "Narratives from Criminal Trials in Scotland," "Manual of Scottish Law," and a treatise on the Scottish Bankruptcy Laws. In conjunction with Sir John Bowring he edited the works of Jeremy Bentham, to which he contributed a valuable introduction, and he also prepared a volume of extracts from these works, which he produced under the title of "*Benthamiana*." He also produced an original work on Political and Social Economy (1849). In biography he was the author of the *Lives of Simon, Lord Lovat*, and *Duncan Forbes of Culloden*, and the "*Life and Correspondence of David Hume*." It was, however, as a writer of history that he chiefly excelled, and his "*History of Scotland from the Revolution to the Extinction of the Last Jacobite Rebellion*" (two vols. 8vo. London, 1853), and his "*History of Scotland from the Earliest Period to the Revolution of 1688*" (seven vols., 1867-70), are standard works. In 1854 he was appointed secretary to the Prison Board of Scotland, and he was subsequently appointed historiographer royal for Scotland, and received from the Edinburgh University the degree of LL.D. He died 10th August, 1881.

BURTON, ROBERT, author of the "*Anatomy of Melancholy*," born at Lindley, in the county of Leicester, on the 8th February, 1578, was descended of a reputable and ancient family. He received part of his education at the grammar-school of Sutton-Coldfield. He was admitted a commoner of Brasenose College, Oxford, in 1593. In 1599 he was elected student of Christ Church. In 1616 he was presented to the vicarage of St. Thomas, and at a later period to the rectory of Segrave in Leicestershire. It is said that he composed the "*Anatomy of Melancholy*," by Democritus Junior," published in 1621, with the intent of averting his own thoughts from that feeling. He died at Christ Church in January, 1610.

The "*Anatomy of Melancholy*" was very popular, and went through five editions before the author's death. Towards the close of the seventeenth century it fell into oblivion, and was seldom seen except on the bookstalls, until brought again into notice by Dr. Johnson, who said it was the only book that ever took him out of bed two hours sooner than he wished to rise. It is one of the most extraordinary books ever written. It is one mass of quotations, classical and modern, sketches and anecdotes, illustrative of the author's theme. So rich a storehouse is it of quaint and curious learning and observation that writers have used it as a mine wherefrom to enrich without acknowledgment their own works. From time to time such an author is gibbeted by a critic who knows his Burton well. The most celebrated plunderer of Burton is Sterne, whom Dr. Ferrier exposed in a crushing manner in his "*Illustrations of Sterne*" (1798).

William Burton, brother of Robert, published a very quaint and interesting "*Description of Leicestershire*" in 1622. He was a lawyer by profession.

BURTON-IN-KENDAL, a market-town in the counties of Westmoreland and Lancaster, 10 miles S. by E. from Kendal, and 241 from London by the London and North-western Railway, is well built, and has a respectable appearance, though many of the houses are old. There is a spacious market-place, with a stone in the centre. The church is an ancient building of plain architecture, with a square tower. There are several charities, a grammar school, flax mills, and a market. Population of the parish, which extends into Lancashire, 2035.

BURTON-ON-TRENT, a market-town in the counties of Stafford and Derby, 21 miles E. from Stafford, and 128 miles N.W. of London by the Midland Railway, is situated on the west bank of the Trent. There is here a bridge of thirty-two arches, and over a quarter of a mile in length. This bridge was erected in 1864, in place of one which was for centuries the longest in England. It was built prior to the Conquest, and substantially repaired in the reign of Henry II. From the new bridge three smaller bridges branch off to different places adjoining the town. Burton consists chiefly of two principal streets, one of which runs parallel to the river, and the other at right angles. There is a branch from Burton to the Grand Trunk Canal, which passes the town on the west side, and the Trent is navigable for barges up to Burton. The town enjoys a universal reputation for its ales, which are largely consumed in the United Kingdom, and exported to every part of the civilized world. There are altogether about twenty breweries—some, such as those of the Messrs. Bass and Allsopp, being by far the largest establishments of the kind in the world—and the number of persons employed in the breweries, malthouses, cooperages, &c., amounts to about 5000. The streets are lined with tramways connecting the larger breweries and malthouses with each other, and with the railways and canal. Hard, instead of soft, water is employed in brewing, and it is owing to the peculiar suitability of the water that the ales have obtained their deserved reputation. In addition to its breweries Burton contains some iron-works, flint, plaster, and cement mills, and a small manufactory of hats. It contains five churches (including St. Paul's, a magnificent present to the town by Mr. M. T. Bass, M.P., in 1874), several Dissenting chapels, grammar-school, town-hall, good museum, literary institute, &c. A charter was obtained from Henry VIII., by which the inhabitants were exempted from serving the office of sheriff, and from being summoned as jurors at the assizes and sessions for the county. Of the once famous abbey, erected in the eleventh century, not a trace now remains. The population of the parish in 1881 was 39,288. Burton-on-Trent was incorporated by royal charter in 1878. Its municipality consists of eight aldermen (including the mayor), and twenty-four councillors. The history of Burton commences with the traditional establishment of a convent on the island of Andressey, in the ninth century, by St. Modwen, an Irish virgin. In 1002 Wulfrie Spot founded an abbey on the site of the present parish church. Domesday Book contains a long and interesting account of its possessions; it was of such importance that some of its abbots were summoned to Parliament. In 1540 the last abbot, Richard Edys, surrendered it to Henry VIII., who, three years subsequently, established it as a collegiate church, with Edys as the first dean. In 1649 Henry accepted a voluntary surrender of the college, and granted it with its property, comprising nearly the whole of that formerly attached to the abbey, to his secretary, William Paget, ancestor of the Marquis of Anglesey, the present owner and lord of the manor. The town has undergone many vicissitudes. It was the scene of a battle, in 1321, between Edward II. and the Earl of Lancaster, who was defeated, and during the Civil War it was repeatedly taken and retaken. In 1255 it was almost entirely destroyed by fire.

and constant disasters have fallen on it through floods. At the beginning of the present century it had a flourishing cotton manufacturing trade, but this has been superseded by the manufacture of beer. It is through an accident that "India pale ale," the most famous of Burton ales, came into general use in England. Made specially to preserve its qualities in hot climates, at first it was only consumed in India, but the wrecking of a cargo on the English coast, and its sale for the underwriters, led to its being known as a beverage in England. Since then the demand for it has spread in every direction.

BURY, a market-town and parliamentary borough in Lancashire, on the Irwell, is 199 miles N.N.W. from London by the Lancashire and Yorkshire Railway, and 9 miles N.N.W. from Manchester. The population of the parliamentary borough was 50,178 in 1881. The town was unaffected by the Redistribution Act of 1885, and it sends one member to the House of Commons.

Under the provisions of the Municipal Improvement Act the town was governed by twenty-seven commissioners, with extensive powers; but it was incorporated in 1876, and its municipality consists of ten aldermen and twenty-nine councillors (including the mayor). It stands on rising-ground; the streets are well paved, and the inhabitants are abundantly supplied with water. The river Irwell, which does not take this name till it reaches Bury, flows through the west end of the town, and is joined by the Roche about 2 miles to the south.

In the reign of Elizabeth the manufacture of woollen cloth was carried on to some extent in Bury, and continued to be so till, on the introduction of the cotton trade into the county of Lancashire, many of the inhabitants became weavers of cotton fabrics, and the woollen trade has been gradually retiring into Yorkshire and other parts of the country. The number, however, still employed in this town in manufacturing flannel, baize, blankets, coating, &c., is considerable. By far the larger portion of the population is engaged in the different branches of the cotton trade, which, owing to the vicinity of Bury to the Manchester market, and the abundant supply of coal and water, are carried on to a considerable and increasing extent in this and the adjoining towns. The mills for the spinning of cotton are large and numerous, and employ a great number of the inhabitants; besides which there are several large bleaching establishments, and iron-works for the manufacture of steam engines, machinery, &c. A great many hats are also made in this town. In the vicinity are extensive coal-mines and stone-quarries.

A branch of the Manchester, Bolton, and Bury Canal, constructed in 1791, furnishes a ready communication with those places, as well as with all parts of the kingdom to which the canal extends. There is also good railway accommodation.

The parish church was formerly a Gothic structure, but in 1776 it was rebuilt, all but the steeple, and in a different style of architecture. Bury contains several other churches; chapels for Independents, Presbyterians, and Wesleyans; two Roman Catholic chapels (one of them a handsome stone Gothic building); a covered market, and new town-hall, in the Italian style; a botanical institution; and three banks. The free grammar-school was founded in 1726 by the Rev. Roger Kay. There are several other schools, libraries, news-rooms, mechanics' institute, and an athenæum—a large and handsome building, containing a lecture and exhibition hall, 85 feet by 43 feet; a museum, and reading and class rooms. The charitable institutions include a dispensary and lying-in charity, supported by annual subscriptions. Adjoining Bury, and included in the parliamentary borough, is the township of Elton, which contains several factories and bleaching and dyeing works.

Bury was created a parliamentary borough by the Reform Act of 1832. The late Sir Robert Peel, whose father greatly

improved the print-works, was born at Chamber Hall, in the immediate neighbourhood, and a large bronze statue to his memory was erected in the market-place soon after his death. John Kay, a native of Bury (though at the time residing in Colchester), invented the fly shuttle in 1738, and, in 1760, his son Robert designed the drop-box, by which patterns of various colours are woven with nearly the same facility as plain calico. The setting of cards by machinery also originated in the same family, in Bury. Bury derives its name from the Saxon word *Byri*, meaning a castle or market-town, which name the Normans did not change, the district being passed over as "derelict." Yet mention is made of it in the Domesday Book. The castle was one of the twelve Saxon strongholds south of the Ribble. The baronial castle was destroyed in the Civil War by the Parliamentary forces.

BURY ST. EDMUND'S, a municipal and parliamentary borough in Suffolk, 77 miles N.E. by N. from London by the Great Eastern Railway. St. Edmund's Bury, as it is called by old writers, at the time of the dissolution of the Heptarchy, belonged to Beodric, who bequeathed it to Edmund the king and martyr, after whom it was called St. Edmund's Bury—bury, burg, burgh, being only another form of castle or strong town. It was a place of consequence in the Roman era, known as the "Villa Faustina" of Antoninus; and in the Saxon times was a royal burgh called "Beodric's worthe," and one of the chief towns of East Anglia. A monastery was founded here in 633, to which in 903 the body of St. Edmund, the Saxon king, was transferred; hence the name. Canute expelled the secular monks, and transferred thither a convent of Benedictines from Norfolk; his and other subsequent endowments made this abbey inferior only to that of Glastonbury; it possessed the franchises of many separate hundreds, and the right of coinage; its abbot sat in Parliament, and had power to inflict capital punishment and determine all civil suits within the liberty. Leland, who saw the abbey probably when in its highest state of perfection, thus describes it:—"The sun hath not shone on a town more delightfully situated, with a small river flowing on the eastern part, or a monastery more illustrious, whether we consider its wealth, its extent, or its incomparable magnificence. You might indeed say that the monastery itself is a town; so many gates there are, so many towers, and a church than which none can be more magnificent; and subservient to which are three others, also splendidly adorned with admirable workmanship, and standing in one and the same churchyard."

Almost the only relic which remains of the magnificence of this monastic establishment is the western gate, now called the Abbey Gate. It was erected in 1327, and is a fine specimen of Gothic architecture. Various ruins of religious and charitable institutions connected with the abbey are still visible.

It was at Bury that King John first met his rebellious barons before he signed Magna Charta. Parliaments met here in 1272, 1296, and 1446, at the last of which Duke Humphrey of Gloucester, called the Good, was arrested, and was found dead in his bed immediately after. The Norman Tower, or Church Gate, was the grand portal into the churchyard opposite to the western entrance of the monastical church. At the dissolution it was converted into a belfry for St. James' Church, and to this circumstance most probably the antiquarian is indebted for the gratification of now surveying this venerable relic of antiquity. It is considered one of the finest specimens in existence of what is called Norman architecture. It is a quadrangular building 80 feet high, and is remarkable for its strength and simplicity. The date of its erection is unknown.

The municipal borough of Bury St. Edmund's, under the Municipal Reform Act, is divided into three wards,

and is governed by six aldermen and eighteen councillors. It is co-extensive with the parliamentary borough, which had a population of 16,111 in 1881, and by the Redistribution Bill returns one member instead of two as formerly.

The town of Bury is pleasantly situated on the river Larke, and from its delightful walks, clean streets, and well built houses forms a pleasant residence. A great part of the town was burned down in 1806, but was shortly afterwards rebuilt.

St. Mary's Church is a beautiful old Gothic building, with a tower of Saxon workmanship. St. James' Church is of later date, Edward VI. having given £200 towards its completion. St. Peter's Church, a handsome Second Pointed building of flint and stone, was erected in 1858. There are several places of worship for Dissenters. The shire-hall is a neat modern building. The guild-hall, where the borough courts are held, is a handsome structure. There is a handsome and commodious corn exchange. About half a mile from Bury is a fever hospital. The Athenæum, a spacious building, contains a noble hall, a library of about 6000 volumes, news-rooms, billiard-rooms, &c. There is a grammar-school, which has been improved and made much more useful under a scheme approved by the Court of Chancery in 1865; a general hospital, rebuilt in 1864 at a cost of £13,000, almshouses, and other edifices. There are no manufactures, the population being entirely agricultural, and trading only in corn, butter, cheese, and wool. Sir Nicholas Bacon, Bishops Gardiner and Prettymann, and Dr. Blount (afterwards bishop of London) were born in the town. It confers the title of viscount on the Koppel family. Ickworth, the magnificent seat of the Marquis of Bristol, is within 3 miles of the town.

BURYING BEETLE (*Necrophorus*) is a genus of CARABID BEETLES (Sphæridæ) belonging to the group CLAVICORNIA and the section PENTAMERA. In this genus the body is of considerable size, oblong in shape, with the ends of the abdomen exposed, owing to the shortness of the wing-cases (*elytra*). The antennæ are thickened at the end. All the species of this genus emit a most offensive odour. The Common Burying Beetle (*Necrophorus vespillo*, Fig. 21, Plate BEETLES) is a handsome insect, marked with broad alternate bands of orange and black, and is found in England. The burying beetles, as their name implies, have the curious habit of burying the dead bodies of small animals, such as mice, frogs, and birds. Bonaves ("Animal Intelligence," 1884) gives the following quotation from Buchner illustrative of this habit:—"The burial is performed because the corpse, if left above ground, would either dry up, or grow rotten, or be eaten by other animals. In all these cases the young would perish, whereas the dead body lying in the earth and withdrawn from the outer air lasts very well. The burying beetles go to work in a very well-considered fashion, for they scrape away the earth lying under the body, so that it sinks of itself deeper and deeper. When it is deep enough down, it is covered over from above. If the situation is strong, the beetles with united forces and great efforts drag the corpse to some place more suitable for burying. They work so diligently that a mouse, for instance, is buried within a few hours. But they often work on for days, so as to bury the body as deeply as possible. From large carcasses, such as those of horses, sheep, &c., they only bury pieces as large as they can manage." In this manner the female deposits her eggs. The larvæ, on emerging from the egg, find themselves comfortably housed and with abundance of food. They are provided with a row of stiff spines on the back, to assist them, it is supposed, in making their way out of the carcass. After quitting the carcass they still remain underground, forming in the soil a sort of cell with smooth inner walls, in which to undergo their change into the pupal state.

BUSAC'O, a village and convent of Portugal, in the province of Beira, on the ridge called the Sierra Busaco, 17 miles N.E. from Coimbra. Here, on the 27th September, 1810, a French army of 65,000 men, under Marshal Massena, were repulsed with great loss in an attack on the position occupied by the Anglo-Portuguese army, about 40,000 strong, under the Duke of Wellington. But, though unable to force this position, Massena succeeded in turning it, when the allies retreated upon the lines at Torres Vedras.

BUSBY, RICHARD, second son of Richard Busby, of the city of Westminster, was born at Sutton in Lincolnshire, 22nd September, 1606. Having passed through Westminster School, he was elected a student of Christ-church, Oxford. In 1610 he was appointed head-master of Westminster School, in which occupation he laboured more than half a century, and by his diligence, learning, and assiduity has become the proverbial representative of his class. He had the pleasure of seeing sixteen of his old pupils raised to the bench of bishops, while Dryden, Locke, and Prior, among other eminent writers, passed through Westminster School during his mastership. His benefactions were numerous and most liberal. He died 6th April, 1695, full of years and reputation, and was buried under a suitable monument in Westminster Abbey. His works were principally for the use of his school, and consist for the most part either of expurgated editions of certain classics which he wished his boys to read in a harmless form, or grammatical treatises, chiefly in a metrical form. The severity of his discipline is traditional.

BUSH ANTELOPE, BUSH BUCK, and **BUSH GOAT** are names applied to a group of small antelopes found only in tropical and Southern Africa. In these antelopes the head is long and pointed, with a wide muzzle and short round ears. The horns are simple and short, straight or slightly curved, and between the ears is a long tuft of hair. The females are hornless. In place of the "tear-pits" found in most antelopes there is a curved glandular line beneath each eye. The Common Bush Antelope (*Cephalophus sylvestris*) inhabits the bushy plateaux of the mountains of Sierra Leone. It is an inactive animal, solitary in its habits, and coming forth from its hiding-places in the thickets only in the evening and early morning. It is about 3 feet high at the shoulder. The hair is of a brown colour, with a whitish streak on the back. The flesh is much esteemed. Another species of the genus is the pretty little Prong Antelope (*Cephalophus pygmaeus*). It is a native of South Africa, dwelling either singly or in pairs amongst dense woods and thickets near the sea-coast. It is only a foot high at the shoulder, and is of a buff colour. The horns are about 1½ inch long, black, conical, and surrounded with conspicuous rings. The generic name *Cephalophus* should more correctly be written *Cephalolophus*, being derived from *kephalē*, head, and *lophos*, tuft, crest.

BUSH SHRIKE is the name given to the birds of the genus *Thamnophilus*, belonging to the division DENTIROSTRIS, of the order PASSERIS. They differ from the ordinary shrakes in the greater length and slenderness of the bill, which is also less strongly hooked at the tip. The bush shrakes are all inhabitants of the tropical parts of South America. They have been called Bataras, from the name applied by the Guaranis to the species common in their country, and Ant-thrushes, from their favourite food.

The Spotted Bush Shrike (*Thamnophilus naevius*), one of the earliest known species, is rather more than 6 inches in length. It is black above, with white spots on the back and wing coverts; the quill feathers are margined with white, and those of the tail have white tips; the lower surface is ash colour. This bird inhabits Cayenne and Brazil, dwelling amongst the bushes, usually in pairs, and exhibits much familiarity, often approaching the dwellings of man. The food of this and the other species consists of ants and other insects and their larvæ, which they generally capture

upon the branches, rarely descending to the ground in search of prey, and then carrying it up into the bushes to devour it. The nest is made of twigs, with the inside sometimes lined with hair. The eggs are whitish, spotted with reddish violet.



Thamnophilus naevius.

Another species, *Thamnophilus vigorsii*, is 13 inches in length. The bill is black and very much compressed. In the male the back, wings, and tail are black, with broad tawny bands, and the under part of the body is a dirty



Thamnophilus vigorsii (male).

whitish brown. On the head is a reddish brown crest, which is blackish at the apex. In the female the bands are whitish and the crest blackish, and the under part of the body ash colour.

BUSH'EL (Fr. *boisseau*). By a law passed in the year 1824, which came into operation on the 1st January, 1826, the imperial bushel superseded all others which had previously been used. It has a capacity of 2218.192 cubic inches, and holds 80 lbs. avoirdupois of distilled water.

BUSHIR or **ABUSHEHR**, a seaport town in the province of Farsistan, Persia, is situated on the north-east coast of the Persian Gulf, in 29° N. lat., 50° 52' E. lon. The population in 1883 amounted to 20,000. Bushir stands at the northern extremity of a sandy peninsula, which forms on the east and north-east a deep bay. Ships of about 300 tons burden can lie in the inner roads about

6 miles north from the town, and ships of larger burden in 25 feet of water, 3 or 4 miles west from the town. The anchorage is tolerably good, but during violent gales from the north-west ships are obliged to bear up for the small island of Karak, to the W.N.W. There is deep water directly east from the town, but a bar prevents vessels drawing more than from 8 to 10 feet water from reaching it. The anchorage at Karak is safe at all times, and ships can lie close to the shore. The climate is extremely hot, especially in June, July, and August. A strong natural position enabled Bushir to make a vigorous stand against the English in 1856, when it was taken by Sir H. Leake.

Bushir is the emporium of a large commerce between the East Indies and Persia, its merchants supplying almost all Persia with Indian commodities as well as with many of those of Europe, and exporting in return the productions of Persia and Turkey to the East Indies and to Europe. Of the imports from India the most important are indigo, sugar, and spices; of the Persian exports, raw silk is the most important. The meaning of the name is "Father of Cities."

BUSH'NELL, HORACE, D.D., an American theologian, was born at Litchfield in Connecticut in 1802, graduated at Yale College in 1827, and after being editor of a newspaper, teacher in a school, tutor in Yale College, and a student of law, entered the Congregational ministry, and was ordained pastor of a church in Hartford, Connecticut, in 1833. Here he remained until 1858, when he gave up the ordinary work of the ministry, though he still continued to labour with much success both as a preacher and an author. He died on the 17th February 1876. In 1847 he published a work entitled "Christ in Nature," and in 1849 "God in Christ," for which he was tried by a congregation of his brother ministers for heresy, being acquitted by seventeen votes to three. He replied to his assailants in a book entitled "Christ in Theology," one of the most valuable of his productions. Among his other works may be mentioned his "Nature and the Supernatural" (1858); "Christ and his Salvation" (1861); "The Vicarious Sacrifice" (1865); and "Forgiveness and Law" (1871), and "Sermons on Living Subjects." His life, by his daughter, was published in 1880.

BUS'KIN, a covering for the leg, commonly a strong outer garment, fit for a defence against dirt, thorns, &c. This word is also used in English as the translation of the Greek *kothornos* and Latin *coturnus*, which signifies a high-heeled shoe or boot used by the Greek and Roman tragic actors to give an appearance of elevation to their stature. *Coturnus* in Latin is employed in contradistinction to *soccus*, the flat-soled shoe worn by comedians. Hence in English authors the words *bushin* and *sok* are often used for the tragic and comic drama. So Dryden:

"Great Fletcher never treads in bushin here,
Nor greater Jonson darts in sok's appear."

BUS'SORAH, BASSORA, BALSORA, or BASRA, a city of Turkey in Asia, formerly in the government of Bagdad, now in that of Arabia, the principal port of the Persian Gulf, on the right or S.W. bank of the Euphrates, or, as here called, the Shat ul-Arab ("River of the Arabs"), 70 miles from its mouth, and 45 below its junction with the Tigris, 270 miles S.E. of Bagdad, and 220 W.N.W. of Bushir. Bussorah is surrounded by walls, built of sun-dried bricks, with a parapet at the top, which have a circuit of about 7 miles, and are passed by five gates. The space actually occupied by buildings does not, however, comprise above a fourth part of this area, the rest being laid out in corn fields, rice grounds, date-groves, and gardens intersected by a number of little canals. There are about forty mosques, innumerable *khans* and coffee houses, and a wretched bath; the bazaars, though stocked with the richest merchandise, are not arched, as in Bagdad and other

Persian cities, but are miserable structures, covered only by mats laid on rafters of date-trees. Bussorah is a place of considerable trade, being the grand emporium of the Turkish empire for Indian and other Eastern produce. Its situation is in this respect so favourable that, notwithstanding the obstacles arising from bad government and unsafe access, both by land and sea, it continues to command a considerable traffic, almost every inhabitant being in some way or other concerned in trade. The palace of the governor and the former English factory are the only fair buildings. The British vice-consul resides at the neighbouring village of Maghil, which, owing to the extreme unhealthiness of Bussorah for Europeans, seems likely to take the trading position of the latter town. The population comprises representatives of many Eastern nations, to which the governing race, the Turks, contribute perhaps the least number. The population numbers about 10,000.

The principal part of the trade is carried on in Arabian bottoms, particularly in those belonging to Muscat. The imports are muslins and piece-goods, pepper, and other spices, drugs, rice, sugar, indigo, silk, cotton yarn, Surat manufactures, shawls, china-ware, and paper, dye-woods, coffee, lac, beads, sugar-candy, and other articles, the produce of India; with lead, iron, steel, tin, quicksilver, cochineal, &c., exported to that country from Europe. The returns to India are mostly made in the precious metals, Arabian horses, pearls, dates (a staple product of Bussorah), copper, gull-nuts, raw silk, gold fringe, coral, gums, rose-water, assafoetida, almonds, dried fruits, &c. There are many canals connecting it with the other branches in the river delta. These serve at once to supply the inhabitants with water for domestic purposes, to irrigate the fields and gardens within the walls, and to admit of the transportation of goods. The canals are filled by the flood, which usually rises 9 feet, and are left nearly dry at ebb tide. They are mere channels dug out of the soil, without being lined by masonry; and the few brick built bridges thrown over them in different parts of the city are of the meanest kind. The country around is very fertile, producing grains, fruits, and vegetables in great abundance. The roses grow in luxuriance, and are cultivated for making attar of roses. At the mouth of the Shat ul-Arab there is a bar which has commonly only about 12 feet of water; but the channel within is deep, and ships of 500 tons burden, provided they cross the bar at spring tides, may, without difficulty, ascend the river as far as the city.

Bussorah originated from a town now called Zobeir, 8 miles to the S.W., founded by the Caliph Omar in 635 or 636, on a canal supposed to be the ancient *Pallacopas*. In a few years it became one of the largest and most flourishing cities of Arabia; but the canal being neglected, and becoming useless, the ancient site of the city was abandoned. The present city was taken by the Turks in 1668, by the Persians in 1777, and by the Montefik Arabs in 1787. A few months after the latter conquest it was retaken by the Turks, to whom it has ever since belonged.

BUST is the name given to a small statue portrait, extending only to the head and shoulders. The classical Latin word *bustum* meant the place whereon the body of a deceased person was burned before committing it to the grave hard by. The gladiators hired to fight at military funerals were called *bustuarii*. From meaning the place where a corpse was burned the word came to mean the trunk of the body itself, and this Low Latin *bustum* or "trunk" has, in the oddest manner, been made to express those statues which do not continue to the trunk, on the time-honoured principle of *lucus a non lucendo*. It is further almost inexplicable how the Romans, with their passion for portrait busts, never coined a name for them. They were called "portraits down to the breast," *signa pectora tenus*, and had no special name. The Greeks also had no distinct term for them. The fervent admiration

for Alexander, not unmixed with flattery, began the era of busts; but the great period of this department of sculpture began with the Roman emperors. It is not too much to say that the intelligent visitor to Rome and Naples knows the features of the principal Roman emperors and statesmen of the first centuries of our era far better than he knows or ever can know those of the great men of his own country. Even after the wreck on wreck of ancient civilization large collections of these valuable portraits exist, and to the student of history and of physiognomy present exhaustless and fascinating interest.

In many ways the bust is actually superior to the statue. For while the first preserves the actual lineaments of the countenance, taken probably from the life, the second, when once the head is completed, is frequently altogether false. Even if the figure be not "improved," the drapery, up till almost the present day, has been most unwarrantably held to be a matter of fancy, and respectable citizens pose in marble in our streets in costumes which would have been the death of them from cold, if not from ridicule, had they really donned them. From these artistic dangers the bust is free, and as it gives the most important features, without the great cost of the complete statue, it has remained permanently in favour, and at the present day forms the chief work of the sculptor.

BUSTARD (*Otis*) is a genus of birds of the order GRALLÆ. The bustards are peculiar to the Old World, and live in wide open plains dotted with patches of shrubby vegetation. Their food consists of herbage, grain, and insects. They run with extreme rapidity, and seldom take wing; but when obliged to rise, their flight is rapid and direct. They are polygamous, and the females incubate in solitariness; the males exceed the females in size, and are more ornamented.

They are generally large and rather heavy birds, with a short, stout, compressed bill, exhibiting some resemblance to that of the game birds. The nostrils are situated in grooves near the base of the upper mandible, and the basal portion of these grooves is clothed with short feathers; the legs are long and moderately slender; the hinder toe is entirely wanting, and the anterior toes are rather short and stout, with blunt claws at their extremities. The wings are of considerable size.

The Great Bustard (*Otis tarda*) was formerly common in our island, and abounded upon Salisbury Plain. It is now quite extinct in England, having vanished from Norfolk, its last stronghold as a British bird, about 1838. One great cause of the extinction of the bird was the introduction of improved agricultural implements, which destroyed the eggs.

The male bustard weighs about 28 lbs., and is furnished with a singular gular pouch, capable, according to Pennant, of containing 7 pints of water. The opening into this pouch is under the tongue. The female is destitute of this pouch, and is about a third smaller than the male.

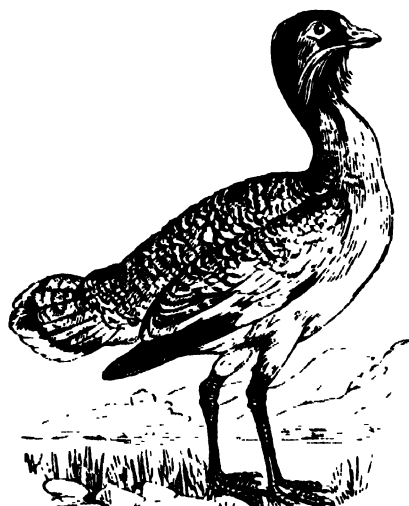
The food of the bustard consists of grain, turnip-tops, green corn, trefail, clover, and the like. It also devours worms, insects, frogs, mice, &c. The female lays two eggs of a yellowish-brown colour inclining to oil-green, with slightly darker variations. The nest consists of a simple depression on the bare ground. The time of incubation is four weeks. The young as soon as hatched follow the parent, but are incapable of flight for a long time. Bustards were formerly hunted with dogs in this country. On the Continent they are now frequently shot with the rifle, and as they are very shy and wild, sportsmen have great difficulty in stalking them. As an article of food the flesh of the bustard is in great estimation. In some parts of France the bustard is still common. In Spain and the plains of Greece, in some parts of Russia, and on the plains of Tartary this bird abounds.

In the male bustard, from each side of the cheeks near

the lower mandible, arises a tuft of long wavy feathers with loose barbs. The fore part of the neck over the pouch is destitute of feathers, the skin being bluish black. The head and back of the neck are bluish gray, and a longitudinal streak of black occupies the top of the head. The upper surface is of fine orange buff barred with zigzag transverse markings of black, and the under parts are white, a tinge of yellow occupying the chest. The tail is white at the base, passing into yellowish brown with one or two black bars. A full-grown male measures as much as $3\frac{1}{2}$ feet.

The female is destitute of moustache-feathers, and the head and neck have a deeper tint of gray than in the male.

Another species, the Little Bustard (*Otis tetrax*), measures only 17 inches in length. It is generally distributed



Bustard (*Otis tarda*), male.

in Southern Europe, Western Asia, and North Africa. In northern countries it is only a straggler, and the individuals killed in Britain cannot be regarded otherwise than as accidental visitors. As they occur here only in winter, and chiefly in the eastern counties, they probably come to us from the north of Europe. The Little Bustard frequents open districts, and has a rapid and powerful flight. Its food consists of herbage, seeds of various kinds, and insects. The eggs are laid upon the ground amongst tall herbage; they vary in number from three to five.

A fine species, common in the Himalayan range and throughout the wide open country of the Marhattas, is described by Gould as the *Otis nigriceps*. Its flesh is highly esteemed. Other species of this group are met with in Africa, India, and Australia; they are all very similar both in appearance and habits.

The Houbara Bustard (*Eupodotis undulata*), which inhabits Northern Africa, is also met with in Spain. It is considerably smaller than the Great Bustard, which it resembles in general form, but has the legs still more elongated; its general colour is yellowish or buff, delicately mottled with numerous small brown spots; the wing primaries are black, with a white spot in the middle; the male is adorned on the head with a crest of long light feathers, and on the sides of the neck with a large ruff of similar plumes.

BUTCHER-BIRD. See SHRIKE.

BUTCHER'S BROOM. See RUSCUS.

BUTE, a county in Scotland, consists of the islands of Bute, Arran, Great Cumbrae, Little Cumbrae, Inchmarnock,

Lamlash, and Pladda. The entire area is 220 square miles, or 140,327 acres, of which (according to the returns issued in 1883) only 25,000 are available for the purposes of agriculture—10,000 being permanent pasture, 6700 devoted to clover or artificial grasses, 5750 to corn, and 3000 to green crops. Oats are grown on nearly the whole of the corn land; the other important crops are potatoes, turnips, and swedes, the quantity of wheat and barley raised being very insignificant. In 1883 there were 7500 head of cattle and 40,000 sheep in the county. The islands are watered by a few mountain streams.

The population of Bute-shire, which in 1851 was 16,608, had only increased to 17,657 at the taking of the last census in 1881. It returns one member to the House of Commons. The chief town is Rothesay, which, together with other parts of these islands, is a favourite resort for tourists and others interested in science or beautiful scenery, and though the climate is moist yet the county is so mild and genial that invalids suffering from lung complaints are frequently recommended to go and reside in one or other of the islands. The Kyles of Bute is a narrow tortuous and almost land-locked strait between the mainland and the island of Bute; it is generally less than a mile across, and the scenery, though not grand, has great beauty. The people were formerly called Brandanens, and furnished the body-guard to the early kings of Scotland, who had a seat at the old Castle of Rothesay.

BUTE, an island from which the county takes its name, is situated in the Firth of Clyde. It is distant about 18 miles from Greenock, and 6 from Arran. It is about 18 miles long, and from 4 to 5 wide. The population in 1881 was 10,998. Bute has an undulating surface of slate in the north, and sandstone and limestone in the south. The soil, which is fertile in some parts, is cultivated on an improved system; and the farm buildings are all good slated houses, well arranged and comfortable. The Marquis of Bute is chief heritor. Traces of iron and coal are found. The island is separated from Argyleshire by a winding channel, called the Kyles of Bute. Bute contains a few small lakes, the largest of which, Loch Fad, is 3 miles in length and about a quarter of a mile in breadth; it supplied the water power for the first cotton spinning establishment in Scotland. Kean, the eminent tragedian, had a seat, in a secluded situation, in the interior of the island. There are numerous Druidical monuments, barrows, cairns, and cists throughout the island, and a vitrified fort at the south end and several ancient chapels. That of St. Blaine is said to have been built towards the close of the eleventh century, on the site of a more ancient building. It was granted in 1204 by Walter, Steward of Scotland, to a monastery at Paisley. The name of Bute is of doubtful origin, some contending for *Both*, a cell, others for *Ey Budh*, ancient British, and *Ey Bhiod*, Gaelic, both meaning an island of food or corn. The climate is moist, but the mildness and equability of its temperature make it an agreeable resort for invalids.

BUTE, EARL OF, JOHN STUART, third Earl of Bute, the eldest son of John, earl of Bute, was born in 1713, and received his education at Eton. In 1737 he was elected one of the sixteen Scottish representative peers, and continued such till 1780. From 1737 he appears to have proceeded in a steady course of court favour. It was probably in this year that he was first introduced to the notice of Frederick, prince of Wales. In August, 1738, he was made a knight of the Thistle, and a few days after one of the lords of the bedchamber to the prince. On the death of Frederick, in March, 1751, Lord Bute, after a short interval, was appointed groom of the stole to the young prince, afterwards George III.

On the accession of George III. (October, 1760), Lord Bute was sworn a member of the Privy Council, and made groom of the stole. In March, 1761, he resigned that

office, and was appointed one of the principal secretaries of state. Mr. Pitt retired from the cabinet on 5th October, before the growing influence of the new secretary; and on 29th May, 1762, Lord Bute became first lord of the Treasury. The history of the administration of Lord Bute belongs to the history of the country; but, whatever were his merits or his demerits, he was certainly the most unpopular English minister of modern times. The numerous caricaturists of the time made him their constant and unflinching butt, most frequently under the figure of a *Jack Boot*, a rude joke upon his name. The only important event in his administration was the termination of the war with France by the peace of Paris, concluded 10th February, 1763. It was long a strong popular belief that the English minister was bribed by France to consent to this treaty; but no evidence worthy of credit was ever brought forward to confirm this rumour. On 8th April, 1763, Lord Bute suddenly resigned, but though he retired from office he still retained the confidence of the king, and he undoubtedly nominated his immediate successors.

Lord Bute passed the last six or seven years of his life in retirement, principally at a residence at Christchurch, in Hampshire. He had the merit of being a liberal patron of men of genius, both in literature and the arts. Among others, Dr. Johnson and Home (the author of the tragedy of "Douglas") were indebted to him—the one for a pension, the other for a place. The architects, George and Robert Adams, and Joshua Kirby, were all employed and munificently rewarded by him. He employed Robert Adams to build a splendid mansion for him at Luton Hoe, in Bedfordshire, where he accumulated a valuable library, and one of the richest collections of paintings, especially of the Dutch and Flemish schools, in the kingdom. He died at his house in South Audley Street, London, 10th March, 1792. He had married in 1736 Mary, the only daughter of Edward Wortley Montagu, of Wortley in Yorkshire, and by that lady he had seven sons and six daughters. His eldest son was, in 1796, created Marquis of Bute in the British peerage.

BUTEA, a genus of plants belonging to the order *Leguminosæ*, named after John, earl of Bute, a great patron of botany. *Butea frondosa* (the dak-tree) is a native of mountainous districts in India. A red rice flows from this tree, which, when evaporated, is found to consist purely of tannin, and is brought into the market under the name of Bengal kino. The East Indian kino is the product of *Pternocarpus marsupium*. The lac-insect (*Coccus*) attacks the young twigs of the dak-tree. The juice of the common flowers, which in this species are 2 inches long, gives to water a bright yellow colour similar to gamboge. This property is also possessed by the dried petals. *Butea superba* grows on the mountains of Coromandel. The flowers are larger than in the former species, and of the same gaudy orange-red colour. The properties are similar. The genus *Butea* is distinguished by the standard in the papilionaceous flower almost equalling the huge acute keel, the one stamen being separate, and the remaining nine united, and by the flat pod dehiscing slightly at the apex with only one seed.

BUTLER, ALBAN, the author of the "Lives of the Saints," by far the best hagiology in the English language, was born at Northampton in 1710, educated at the Roman Catholic college of Douai, became professor there, and published his great work in five 4to volumes (1745). He became president of the English Catholic seminary at St. Omer, where he died in 1773.

BUTLER, JAMES, Duke of Ormond. See **ORMOND**.

BUTLER, BISHOP JOSEPH, born at Wantage, in Berkshire, in 1692, was the son of Thomas Butler, a respectable shopkeeper, and a Dissenter of the Presbyterian denomination. He received the rudiments of his education in the free grammar-school at Wantage, whence he was

removed to the Dissenting academy of Tewkesbury, in Gloucestershire. It was here that Butler gave the first proofs of the peculiar bent of his mind to abstruse speculation. Being dissatisfied with the argument *à priori* of Dr. Samuel Clarke in his "Demonstration of the Being and Attributes of God," he ventured, being then only in his twenty-second year, to express by a letter his doubts, and to offer his objections, to that acute writer. About this time Butler was led to a more particular examination of the tenets of the religious body to which he belonged, the result of which was a secession from Presbyterianism and a conformity to the Church of England. He entered Oriel College, Oxford, in March, 1715, and soon after was admitted into holy orders. In 1718 he was recommended by Mr. Talbot (a son of the Bishop of Durham) and Dr. Clarke to Sir Joseph Jekyll, master of the Rolls, by whom he was appointed preacher at the Rolls. In 1721, on being presented by Bishop Talbot to the rectory of Haughton, near Darlington, he divided his residence between the Rolls and his parochial benefice. In 1725 he received Stanhope, one of the wealthiest but most retired rectories in England, from the same patron, in exchange for Haughton. In 1726 he resigned the Rolls' preacher'ship, and went to reside upon his rectory at Stanhope. In the same year he published a volume of fifteen sermons preached at the Rolls. The first three of these sermons contain those ethical views with which his name has been so prominently associated; and there are few facts more remarkable than the powerful influence they have exerted, notwithstanding their brevity, on the course of ethical inquiry in this country. Viewed as a contribution to ethical science, a competent modern critic observes, that "in their own department nothing superior in value appeared during the long interval between Aristotle and Kant."

His residence at Stanhope continued until 1733, when he was drawn from his retirement by being appointed chaplain to Lord Chancellor Talbot. In 1736 Butler was appointed clerk of the closet to Queen Caroline, upon whom he was in constant attendance until her death in the following year. In 1736 he published his great work, "The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature." Directed against the deism prevalent at that period, this book at once took its place as the best answer that had appeared. Viewed simply as a reply, it is generally admitted that Butler has established his point, which was to show that all the objections to revealed religion are equally applicable to the constitution of nature. He had not designed his work to be an absolute and adequate proof of the truth of the Christian system, but rather to remove difficulties, and in his own quietly ironical language to show that it is "not so clear a case, as many suppose, that there is nothing in Christianity." But when he has dealt with the position taken up by the deists of that period, he aims at finding a general train of argument which should carry unprejudiced and discerning minds along with him. Much had been said of nature, and the comparative excellence of its course of action and government. There was no dispute as to its divine authorship, and this, accordingly, Butler makes the starting-point and fruitful principle of his whole argument. Admitting the course and constitution of nature to be divine, he maintains that all the characteristic facts and principles of religion, natural and revealed, are in strict analogy therewith. There is a parallelism throughout—a correspondence of plan and issue, of type and result; and if the lower be divine, the higher must therefore be no less so. Being of the same make, they must have the same author. While, however, the answer to the deistical opponents of Christianity may be considered as complete, it must be admitted that Butler's arguments have been used to support conclusions that he would have been the first to resent, and that the present field of controversy between

the opponents and defenders of religion is far removed from that in which he contended for the faith.

In 1738 Butler was appointed Bishop of Bristol, and in 1740 he was presented to the deanery of St. Paul's, on which occasion he resigned the rectory of Stanhope. He laid out on the episcopal palace of Bristol £1000, and was a munificent benefactor to charitable institutions. In 1750 he was translated to the see of Durham, vacant by the death of Dr. Edward Chandler. The short time that he held this see allowed him to make only one visitation of his diocese. The charge which he delivered to his clergy on that occasion subjected him to much animadversion. He had begun by lamenting the general decay of religion, and noticed it "as a complaint by all serious persons." As an aid in remedying this evil, he recommended his clergy to "keep as well as they were able the form and face of religion with decency and reverence, and in such a degree as to bring the thoughts of religion often to the minds of the people, and to endeavour to make this form more and more subservient to promote the reality and power of it." Bishop Butler died at Bath on 16th June, 1752, and was buried in Bristol Cathedral. His writings, though not numerous, are sufficient to show the extent of his knowledge, the solidity of his judgment, and the great powers of his mind. His statement of a question is fair and candid, his reasoning is close and sincere, and his conclusions nearly always just and convincing. His piety was unostentatious but fervent, with something, from natural disposition and the grave direction of his studies, approaching to gloom. Still, "no man ever more thoroughly possessed that 'meekness of wisdom' which the apostle enjoins. Neither the consciousness of intellectual strength, nor the just reputation which he had thereby attained, nor the elevated station to which he had been raised, in the slightest degree injured the natural modesty of his character or the mildness and sweetness of his temper." Bishop Butler was never married. His works are collected in two volumes 8vo, which have been several times reprinted.

BUTLER, SAMUEL, author of the famous "Hudibras," was born at Strensham, in Worcestershire, in 1612, and educated in the cathedral school at Worcester. Of the early part of his life there are but few well-authenticated facts and dates. He was first in the service, probably as justice's clerk, of Mr. Jeleries of Earl's Croome, in Worcester. He afterwards resided with Elizabeth, countess of Kent, at Wrest, Bedfordshire, where he became intimate with Selden; he was next for a short time in the service of Sir Samuel Luke, of Wood End, in Bedfordshire. As his master was a rigid Presbyterian, and a colonel in the Parliamentary army, it is evident whence Butler drew the materials for his famous character. After the Restoration he became secretary to Richard, earl of Cauberry, lord president of the principality of Wales and steward of Ludlow Castle, soon after which he married Mrs. Herbert, a gentlewoman of good family. The latter part of his life he spent in quiet seclusion, and in familiar intercourse with the chief literary characters of the day; and, if not rich, certainly not in the extreme poverty in which he has been frequently represented to have been. He died in Rose Street, Long Acre, in 1680, and was buried in the churchyard of St. Paul's, Covent Garden. The first part of the immortal "Hudibras," containing three cantos, was published in 1662, and soon became eminently popular, and was much quoted even at court. In the next year appeared the second part. The third part, which does not bring the poem to a conclusion, was not published till 1678. There is no story or plot to "Hudibras." It is a mere collection of ludicrous situations, in which a sort of canting Presbyterian mock image of Don Quixote, named Hudibras, together with his squire Ralpho, are continually shown for the purpose of crushing the Puritan spirit by consummate ridicule. Butler's enormous services to the restored mon-

archy by laughing away the remains of danger were never rewarded. Aubrey says, "He might have had preferments at first, but would not accept any but very good, and so got none." Three small volumes of spurious posthumous works were published. Two more, undoubtedly genuine, were afterwards printed by Mr. Thyer of Manchester. In 1721 John Barber, citizen, and at one time lord mayor of London, erected a cenotaph in Westminster Abbey to Butler's memory.

BUTO'MEE, a tribe of plants belonging to the order ALISMACEÆ. The type of the tribe is the *Butomus umbellatus*, a common water-plant of this country. The Butomeæ are perennial stemless herbs, living in water or marshes. They are distinguished by having three segments of the six-leaved perianth coloured like petals, and by the numerous carpels with the seeds covering the inner surfaces.

The plants belonging to the genus *Butomus* are native of the north temperate zone. The flowers are disposed in umbels; the nine stamens are so arranged that six are in pairs opposite the three sepals, and three opposite the three petals; the carpels dehiscence ventrally. *Butomus umbellatus* is a rush-like plant with three-cornered sword-shaped leaves, and umbels of handsome rose coloured flowers. It is commonly called the Flowering Rush, and is accounted the handsomest herbaceous plant of the British flora. Its roasted root-stock is eaten in Northern Asia. The genus *Limnochlois* is remarkable for the large pore at the apex of the leaves, from which clear water is exuded. The flowers are in umbels, and the carpels dehiscence dorsally. These plants are natives of tropical America. *Hydrochlois*, another tropical American genus, has noddy juice and solitary flowers. *Butomopsis* is an African genus.

BUTTER is the fat or oleaginous parts of the milk of various animals, principally of the domestic cow. The milk of the cow consists of cream, whey, and butter, and is esteemed chiefly in proportion to the amount of butter, which differs much in that of different breeds.

Cows should be milked in the cool of the morning and evening, and not much driven immediately before milking. In some situations it is best to milk them in the pastures, and to carry the milk home with the least possible agitation. The milking-house, and all the vessels used, should also be kept most scrupulously clean and sweet; and tin or copper vessels are preferable to wood, as being less easily tainted. When brought into the dairy the milk is strained through a fine sieve or cloth into shallow pans, or troughs lined with lead, which are filled to the depth of 4 or 5 inches. These should be in a place sheltered from the sun, but having a thorough draught of air by means of opposite wire windows. The floor should be kept moist in summer, to produce coolness by evaporation, but in winter a small stove is an advantage, provided smoke and smell be avoided. After standing twelve hours the finest parts of the cream will be found to have risen to the surface, and this, if skimmed off, will furnish a very delicate butter. More generally, however, the milk is allowed to stand twenty-four hours, and then the cream is collected either by skimming, or by letting off the thin milk from beneath it by opening plugs in the troughs. The cream is put in a deep earthen or stoneware jar, which should be glazed; and more is added every day until there is sufficient to churn. The cream is usually stirred from time to time, to promote a slight acidity, which facilitates the process of churning; and sometimes this is produced by adding a little vinegar or lemon juice; but, however this acidity may facilitate the churning, it impairs the quality of the butter, especially if for salting.

The separation of the butter from the thinner portions of the cream is effected by agitation in a machine called a *churn*, of which there are many kinds, in some of which a wooden beater, resembling a piston pierced with holes, is

moved up and down in an upright barrel, while in others the like effect is produced by a rotatory motion. The barrel of the churn should not be more than two-thirds full of cream. In the course of an hour's agitation or churning, small kernels of butter are found among the cream, and these become gradually united into a solid mass, leaving a fluid residue called *butter-milk*, which is set aside for domestic use, or for feeding pigs. The butter is then removed to a shallow tub, well beaten with the hand or a flat wooden spoon, and repeatedly washed with clear spring water, until all the remaining butter-milk is removed from it; after which, if intended to be sold fresh, it is made up in rolls or cakes for the market, or salted and put into casks if intended for keeping. In salting butter the quality of the salt is of great importance; and some, instead of simple salt, use half an ounce of dry salt (pounded fine), two drams of sugar, and two drams of saltpetre, to every pound of butter.

Butter may be preserved for domestic use, without salt, by melting it very gently, without boiling, which causes the watery particles to evaporate, and the curd, which is always present in small quantity and is a principal cause of rancidity, to fall to the bottom. The clear butter is then poured into an earthen vessel and covered with paper, and a piece of bladder or leather is tied over it to exclude the air. Butter thus prepared resembles lard in appearance, loses some of its flavour, but is much superior to salt butter for ordinary purposes.

In Devonshire, instead of the ordinary mode of raising cream in shallow pans, the milk is, after standing twelve hours, exposed to heat, without boiling, by which a thick scum, called *clotted cream*, more solid than cream but not so solid as butter, is thrown up. A very slight agitation converts it into butter. Another mode, followed in parts of Holland, Scotland, and Ireland, is to churn the milk and cream together, by which, it is said, more butter is produced.

Too much attention cannot be paid to the most minute circumstances in the manufacture of butter, especially in all that relates to cleanliness, as it is very liable to be contaminated by the slightest foreign matter. It has been found in experience that even when the dairy workers are careful in cleansing their hands, arms, &c., that the insensible perspiration of the body will sometimes exert an injurious influence, and the Americans have invented a wooden butter worker to obviate this. Even more effluvia may give a turn to the chemical action which commences as soon as the milk is exposed to the air. The extending use of the thermometer is an important improvement in dairy practice.

The nature of the pasture is also important. The best butter is produced from cows fed in rich natural meadows; and some plants which grow in poor and marshy soils impart a disagreeable flavour to the butter, as also do turnips and other roots, and most cut grasses. This may be in some measure obviated by adding a little water and saltpetre to the milk, or, it is said, by giving salt to the cows with their food. The best winter butter is made where the cows are fed with good meadow hay, or after-math hay, which contains few seedstalks. The colour varies much from different cows, and from the same at different times. *ANNATTO* or the juice of carrots is sometimes mixed with the cream to impart a deeper yellow.

Upon an average 4 gallons of milk produce 16 oz. of butter; and, to be profitable, a good dairy cow in England should produce 6 lbs. of butter per week in summer and 3 lbs. in winter, allowing from six weeks to two months for her being dry before calving. This makes 120 lbs. in twenty weeks after calving, and 80 lbs. in the remaining time, or 200 lbs. in the year.

Whey butter is an inferior kind made in some cheese dairies from the oily portion of the milk skimmed from the whey. It is sold chiefly to labourers, seldom comes to market, and is totally unfit for salting and keeping. *Likee*,

or fluid butter, is mostly prepared from the milk of buffaloes, and is an article of considerable commercial importance in some districts of India. It is usually transported in dippers, or bottles made of hide, each containing from 10 to 40 gallons. *Butterine* is an artificial substitute for butter, made extensively in the United States and France, and exported to Great Britain in large quantities. It is made chiefly from finely minced beef suet, mixed with water, carbonate of potash, and fresh sheep's stomachs cut up into small fragments, and heated. When cool the fat thus produced is separated by powerful hydraulic pressure into stearin and oleomargarin—the latter of which only is used for butter-making. It is churned with milk, and after being well washed is, in general appearance, taste, and consistency, exactly like ordinary butter.

Nearly all the butter that is produced in England is consumed at home, and a large quantity is imported, the total of butter and butterine in 1884 being 2,472,567 cwts., valued at £12,526,293. The countries from which this supply was principally received were Holland, France, Belgium, Channel Islands, United States, and British North America. It may, perhaps, be doubted whether the enormous import mentioned will increase, for some alarm has of late years been aroused at the many millions spent for foreign dairy produce. Gentlemen not at all dependent on farming have started herds of dairy cows; and if the example were followed to any moderate extent, there is no question that the imports might be largely reduced.

BUTTER, in pharmacy, an obsolete name for the hydrochlorate of certain metals, such as butter of antimony, of arsenic, bismuth, tin, and zinc. See next article.

BUTTER or **OIL OF ANTIMONY**, now known in chemical language as the trichloride of antimony ($SbCl_3$), is produced by distilling a mixture of mercuric chloride (corrosive sublimate), and trisulphide of antimony. The trichloride of antimony distils over, and congeals on cooling into a yellowish-white substance which is thought to resemble butter in appearance, and hence its name. The residue remaining in the retort is mercuric sulphide, and is commonly termed cinnabar of antimony.

The above compound, which is the true butter of antimony, is seldom seen but in chemical laboratories, the deep brown liquid sold as butter of antimony in the shops being a solution of the trichloride in excess of hydrochloric acid. It acts as an energetic caustic, and is much used by farmers, &c., as an application to the feet of sheep for foot-rot. It is only employed in medicine as a caustic, and has sometimes been used as an application to parts bitten by rabid animals or venomous serpents.

BUTTERCUP. See *RANUNCULUS*.

BUTTER-FISH (*Centrolophus gunellus*) belongs to the *BLENNY* family of the order *ACANTHOPTERYGII*. This fish is common on the British coasts. The body is long, and is covered with very small scales. The snout is short, and the jaws are furnished with very small teeth. The dorsal fin is long, occupying the whole length of the back, and is composed of spines only. In addition to the scales, the body is covered with thick mucous secretion. The butter-fish, or gunnel, as it is sometimes called, is about 7 inches long, and is of a purplish-brown colour, with dark spots on the back.

The name butter-fish is also given to the *Coridodon pullus*, a New Zealand fish allied to the *WRASSE*. This fish has no distinct teeth in the jaws, the edges of which are sharp. It feeds on zoophytes, which it scrapes from the surface of kelp. Like the gar-pike its bones are green.

BUTTERFLIES form, with *MOTHS*, the order *Lepidoptera* (Gr. *lepis*, scale; *pteron*, wings), so-called from the minute scales which cover the wings.

Butterflies are distinguished from moths chiefly by the form of the antennæ, which have a club or knob at the tip, whereas in moths the antennæ are more slender at the tip

than lower down. This is the reason for the name *Rhopalocera* being given in zoology to butterflies—from the Greek *rhopalon*, club; and *keras*, horn. Another mark of distinction is that the butterflies are only active by day, while most moths fly only during the evening or at night. Another rough test is that butterflies, in settling, do not fold their wings nor lay them one over the other, but raise them above the body, so as to display the under surfaces.

Butterflies have four well-marked stages in their life, namely, the egg, larva or caterpillar, pupa or chrysalis, and imago or perfect insect. The egg is instinctively deposited in places where the caterpillar, on emerging, will find its appropriate food. The eggs are interesting objects under the microscope, the hard shell having various shapes, colours, and markings. A few days is usually sufficient for the eggs to arrive at maturity. One of the first things to be noticed in the development of the embryo, is the appearance of transverse lines, dividing it into sixteen segments. On the first (the *pro-oral*) segment appear the rudiments of the antennae and labrum; and on the three following segments are found the mandibles and two pairs of maxillae. These segments are united into one in the caterpillar to form the head. The three segments which follow are the future thorax, and bear rudimentary appendages. There are also appendages on the abdominal segments, some of which are often retained in the caterpillar ("pro-legs"). This, according to Balfour ("Embryology," 1880), is "a fact which shows that insects are descended from ancestors with more than three pairs of ambulatory appendages." Just before "hatching," the larva can be seen through the semitransparent shell coiled up in the egg. The mouth of the caterpillar is formed for biting, and frequently great havoc is done to vegetable life. The second, third, and fourth segments, corresponding to the thorax of the future butterfly, have each a pair of legs; and sometimes as many as five of the hinder segments are provided with jointed "false legs," outgrowths of the skin. During this larval stage the skin is moulted about five times, in some species more, in others less. The change to the chrysalis condition takes place generally in a few days after hatching, but in some cases, as in the goat moth, the caterpillar lives for two or three years. Caterpillars are very liable to be devoured by birds, &c., and for the sake of protection many of them are covered with hairs, or have a nauseous smell. In a few species the hairs are stings, and can be protruded at will. Ichneumon flies also are very destructive of caterpillars; the flies lay their eggs in the body of the insect, and the larvae feed on the fatty portions of it, without touching the vital parts, until they are ready to emerge. The body cavity is chiefly occupied by the digestive system, and towards maturity by the tubes in which the silk is elaborated for spinning. When the caterpillars are about to assume the chrysalis condition they dispose of themselves in various ways, occasionally spinning a cocoon, but generally suspending themselves by a silken thread. When the last skin is cast off the chrysalis remains incapable of feeding or of any movement, except a twitching of the abdomen. The hard skin in which the chrysalis is encased does not allow the limbs to be seen separately, as is the case with the pupa of beetles, bees, and ants. In this butterfly agree with moths, but differ in the pupa cases being angular. Though outwardly quiescent, great changes are going on inside. The digestive system becomes contracted, the rudiments of the wings are formed, the biting mouth is altered into one which is adapted for sucking up the sweet juices of flowers. The time during which the pupa stage lasts varies, and even in the same species is different, according to the time of the year. Thus, if the caterpillar of the tortoise-shell butterfly changes in the spring, it takes about a fortnight to develop into the perfect insect; if in the summer, the period is shortened to eight or nine days;

whereas if the pupa stage is only assumed in the autumn, the butterfly does not appear till the following spring. When at length the development is complete, the seams crack, and the insect extricates itself at the same time discharging a drop or two of liquid. This fluid is occasionally of a blood-red colour, and the appearance as of "blood rain," which occurs on rare occasions, has excited the superstitious fears of those who were ignorant of the true cause.

As with other INSECTS, the segments of the body, so easily observed in the embryonic condition, are in the imago grouped into three parts—the head, the thorax, and the abdomen. On the head are placed the mouth and the organs of sense. There are two large compound eyes on the sides, containing, as it has been computed, 31,620 "eyelets." Often, also, two simple eyes (*ocelli*) exist at the top of the head. The antennae are composed of many joints, and are long and straight; in the family *Hesperiidae* they are hooked at the tip. The biting parts of the mouth are all quite small, but the sucking tube or "tongue" is formed of two long and slender maxillae, which can be separated and cleaned. The tongue, when not in use, is coiled in a spiral below the head. The thorax is provided with the locomotive organs—three pairs of legs and two pairs of wings. In some families of these insects the front legs are small or rudimentary; the colours of the wings are often very brilliant; and some of the tropical butterflies are the most beautiful objects in nature, the hues surpassing those of birds and flowers in intensity and purity. Mr. A. R. Wallace, in "Tropical Nature," says—"Instead of the sober browns, the plain yellows, and the occasional patches of red, or blue, or orange that adorn our European species, we meet with the most intense metallic blues, the purest satiny greens, the most gorgeous crimsons, not small spots, but in large masses, relieved by a black border or background. In others we have contrasted bands of blue and orange, or of crimson and green, or of sky yellow relieved by velvety black. In not a few the wings are powdered over with scales and spangles of metallic green, deepening occasionally into blue, or golden, or even red spots. Others again have spots and markings as of molten silver or gold, while several have changeable tints, like shot silk or richly-coloured opal." The scales form the seat of the colour, which is due sometimes to a pigment, or colouring matter, and sometimes to very fine and close lines on the scales, which reflect the light in various ways. White, yellow, brown, black, red, and some kinds of blue markings are derived from pigments; while gold, silver, blue, green, amethyst, crimson, &c., are due to the striation of the surface of the scales. Sometimes the scales are wanting in certain spots, and the membrane of the wing is seen as transparent as glass; often the greater part of the wing is of this character. "One of these clear wings is especially beautiful, namely, the *Itania Esmacalda*. It has one spot only of opaque colouring on its wings, which is of a violet and rose hue; this is the only part visible when the insect is flying low over dead leaves in the gloomy shades where alone it is found, and it then looks like a wandering petal of a flower" (Bates). Some butterflies are slow in their flight, especially the tropical families of *Heliconidae* and *Danaidae*. Mr. Bates, in speaking of species of *Morpho*, says "that it is a grand sight to see these colossal butterflies by twos and threes floating at a great height in the still air of a tropical morning. They flap their wings only at long intervals, for I have watched them to a very considerable distance without a stroke . . . The largest specimens of *Morpho Cisseus* measure 7½ inches in expanse. Another smaller kind, which I could not capture, was of a pale silvery-blue colour, and the polished surface of its wings flashed like a silver speculum as the insect flapped its wings at a great elevation in the sunlight."

Butterflies are found in all regions of the world; in Spitzbergen during the brief summer, on the Alps of Europe up to a height of 9000 feet, on the Andes to double that elevation, and throughout the tropics in very great numbers and variety. In Britain there are sixty-six different kinds; in the whole of Europe, 390. Many of these are only found in certain restricted localities, while other species, such as the Painted Lady (*Vanessa cardui*), are scattered all over the world. An entomologist collecting in Britain alone would need to travel through the country for some years before a collection of the sixty-six species would be complete. In the tropics, and especially in South America, the numbers of different kinds in comparison are astonishing. Mr. A. R. Wallace says that in one of the Malay Islands from thirty to forty species may be obtained any fine day in good localities, while a few months' assiduous collecting will produce from 150 to 200 species. The district round the city of Para, in Brazil, is richer in butterflies than any other, more than 700 species having been collected, and 600 of these in one year. Mr. Bates speaks in glowing terms of the butterflies near Egi, on the Upper Amazon, on a white sandy beach between the lake and the forest: "The number and variety of gaily-tinted butterflies sported about in this grove on sunny days, were so great that the bright moving flakes of colour gave quite a character to the physiognomy of the place. It was impossible to walk far without disturbing flocks of them from the damp sand at the edge of the water, where they congregated to bask in the mid-sun. They were of almost all colours, sizes, and shapes. I noticed here altogether eighty species, belonging to twenty-two different genera. * It is a singular fact that, with very few exceptions, all the individuals of these various species thus sporting in sunny places were of the male sex; their partners, which are much more soberly dressed and immensely less numerous than the males, being confined to the shades of the woods. Every afternoon as the sun was getting low I used to notice these gaudy sun-bine-loving swains trooping off to the forest, where, I supposed, they would find their sweethearts and wives. The most abundant, next to the very common'splendid yellow and orange coloured kinds (*Caliphas*, seven species), were about a dozen species of *Cybalis*, which are of large size and are conspicuous from their liveries of glossy dull blue and purple. A superbly adorned creature, the *Callithoe Marlini*, having wings of a thick texture, of faded saffron blue and orange, was only an occasional visitor. On certain days, when the weather was very calm, two small gilled-green species (*Scaevania trochilus* and *Calidote*) literally swarmed on the sands, their glittering wings lying wave upon the flat surface."

The migrations of butterflies is a subject which needs investigation. Tremont, while in Chile, frequently saw flights of these delicate creatures miles in breadth, and of such extension as to occupy hours and even days in their passage. Sir R. Schomburgk, ascending the river Essequibo, in British Guiana, on the 10th of November, 1838, saw a cloud of butterflies which continued crossing the course of the river nine hours and a half. During this time the beach was covered 9 miles so that these butterflies formed a cloud 1/2 in width, and of such length that it was nine hours and a half in crossing the river, notwithstanding the rapidity of the insects composing it. Darwin mentions that during the voyage of the *Beagle*, when they were 10 miles out at sea from the Bay of San Blas, such numbers of butterflies passed that, even with the aid of a telescope, it was not possible to see a space free from them. The sailors cried out that it was a "swarming of butterflies." Mr. Belt, during the five years that he lived in Nicaragua, noticed every season a great number of these migratory swarms, some continuing to pass for a period of four or five weeks, and always in the same direction, towards the south-east; there were never any return swarms. While

in Brazil he also saw them travelling to the same point of the compass.

As regards the antiquity of butterflies, a species of *Vanessa* has been discovered in the Lower Miocene beds of Croatia, retaining the pattern of the wings and even some of its colours; it is named *Vanessa Pluto*, and corresponds, says Heer, with *Vanessa Hadena* of India. An extinct genus has been obtained from the Lower Oolite, but butterflies probably date back to Palæozoic times, since a moth (one of the *Bombycidae*) has been found in the coal formation of Belgium.

Butterflies are divided into five families:—(1) Papilionidae, (2) Nymphalidae, (3) Erycinidae, (4) Lycaenidae, (5) Hesperidae.

1. In the family Papilionidae the native swallow-tail butterfly (*Papilio machaon*) is a characteristic species. This family is known from the others, except Hesperidae, by the possession of six perfectly developed legs in both sexes. The chrysalis is attached by the tail, but is generally erect and fastened at the middle by a silken thread.

There are two groups in the family, the Papilioninae and the Pierinae. In the former the anterior tibiae have a stout spur about the middle. The larva is furnished just below the head with two retractile tentacula, which the creature has the power of extending when irritated, evidently for the purpose of defence, as at that time they emit an aromatic but generally disagreeable odour. The head of the chrysalis is forked, square, or rounded. The finest and largest of the group belong to the genus *Ornithoptera*, or "bird-winged butterflies," the species of which are found chiefly in the Malay Archipelago. In this genus is placed the noble *Priamus* butterfly, the male of which has the front wings of a rich velvet black, with splendid satin-green markings, the green varying in different lights; the hind wings are green, with orange and black markings. The females are brown, with dull white or yellowish markings. In *Ornithoptera croesus* the green of the *Priamus* is replaced by a fine yellow, which in certain lights is shot with tinges of green. This species was first discovered by Mr. Wallace on the island of Batehian among the Molucca Islands. It has not been found anywhere else except in the neighbouring isle of Gilolo. *Ornithoptera brookiana* is shown in Plate I., fig. 2.

The group Pierinae is readily known from the preceding by the want of the spur on the anterior tibiae. The larva is more or less pubescent, and has no tentacula. The head of the pupa is always pointed. The Pierinae form an extensive group of insects scattered over the whole world. The prevailing colours in the insects of this family are white and yellow. Our common cabbage butterfly (*Pieris brassicae*), and brimstone butterfly (*Gonepteryx rhamni*) are characteristic examples of the family. The genus *Zegris*, one species of which (*Zegris eupheme*) is found in Spain and in the Crimea, is singular among butterflies, inasmuch as the larva spins a delicate silken net like web on the stems of the *Sinapis*. The species of *Anthocharis* have the wings in the males tipped with orange, or with pinkish red; they are commonly called Orange-tips.

2. The Nymphalidae are known by having very small front legs in both sexes. The chrysalis generally hangs head downwards. In the genus *Ageronia* most of the species are of a peculiar gray and white, very much resembling the colour of some barks and of lichens. Darwin, in the "Voyage of the *Beagle*," thus refers to the habits of the *Ageronia fremia*:—"This butterfly is not uncommon, and generally frequents the orange groves; although a high flyer, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards, and its wings are expanded in a horizontal plane, instead of being folded vertically as is commonly the case. This is the only butterfly I have ever

seen that uses its legs for running. But a far more singular fact, is the power which the insect possesses of making a noise. Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me; and I distinctly heard a clicking noise similar to that produced by a toothed wheel passing under a spring catch."

The species of *Danaus* (belonging to the group *Danainæ*) are found both in the New and the Old World. A species of this genus, with its characteristic brownish-red hue and black markings, is represented on some Egyptian wall paintings in the British Museum. The same species is still abundant in Egypt and in the Mediterranean district.

The group *Heliconiæ* is a very extensive one, which may be said to be peculiarly American. They have elongated front wings generally much rounded externally, and narrow hind wings. Those species with white spots on a black or bluish ground (as *Iteate*, *Sappho*, and *Antiocha*) live in the forests of Surinam. They fly in a free and easy manner, and do not rise high. The most common species are those with red or yellow spots on the upper wings and with no radiating marks on the lower, as *Melpomene*, *Sara*, *Thamar*, and others. They live in the neighbourhood of habitations, have a bold undulating flight, and rarely proceed in a straight course. Some which have yellow or red spots on the fore wings and red or fulvous rays on the second (as *Doris*, *Erato*, *Cynisca*, and others) are found only in the woods. They do not rise high above the ground, and they fly quickly with a sailing and sometimes with a bounding flight. The species in which yellow predominates, mixed with black (such as *Eva*, *Egina*, *Polymnia*, &c.), for the most part frequent woods. Those with very narrow wings and elongated abdomen have an unequal jumping flight, and often alight in great numbers on flowers, when they are easily captured. These insects have a peculiar gland or appendage at the end of the abdomen. It is concealed between the valves of the anus, but is capable of being protruded. In the *Lycorea halia* this gland takes the form of a radiating tuft of hairs, which term when exerted, two feathered globes at the end of the abdomen. In one species this gland is in the shape of small fleshy balls of an orange colour. When the insect is captured, these balls are exerted, and they give out a peculiar penetrating aromatic odour which somewhat resembles the smell of chamomile. One of the first butterflies to attract the notice of the naturalist in Jamaica is the *Heliconia clarionia*. Its beauty and singularity of form, the great length and little breadth of the wings, the length and slenderness of the body, and the brilliant contrasts of colour, lemon-yellow and velvety black, together with the very peculiar flapping of the wings in flight, as if their length rendered them somewhat unwieldy, excite a sensation of delighted surprise. Plate II., fig. 5, shows the *Heliconia hermathena*, and fig. 8 *Heliconia hecatesia*.

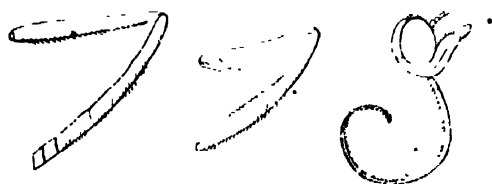
In the group *Acræine* the wings of many of the species are semitransparent; the larvæ have much resemblance to those of the *Fritillariæ*, being cylindrical and spiny; the spines are long and set with little whorls of hairs or more delicate spines. The metropolis of this group is Africa, particularly in the western parts, such as Sierra Leone.

The butterflies of the group *Nymphaliniæ* have, almost without exception, the fore legs short and not fitted for walking. The tibiae and tarsi of the male are often clothed at the sides with a fringe of fine hairs, forming a flattened brush; the tarsus consists of a single elongated joint, blunt at the tip, and without claws (fig. 1); the eyes and labial palpi are large, the latter extending considerably in front of the head; the thorax is large, and the wings are large and often greatly variegated in colour, and marked with "eye" spots; the larva is long and more or less spined,

generally not attenuated behind, and blunt at the end; the chrysalis is elongated, and is simply suspended by the tail, hanging by the extremity of the body, and not girt across the middle by a skin of silken thread.

Mr. Bates found out when in Brazil how to distinguish the sexes of the *Nymphalidiæ* by the fore legs—the fore

Fig. 1.

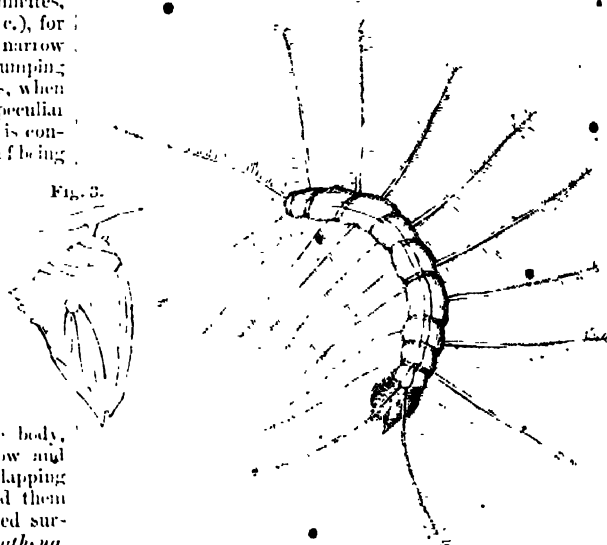


tarsi in the males have a few pairs of minute spines at the apical joints, which are not found in the other sex. This difference prevails in the *Heliconiæ*, *Satyrinæ*, and *Erycinidæ*.

The Painted Lady Butterfly (*Cynthia cardui*) is universally distributed; it is found throughout Europe, Asia, Africa, and America, in Greenland, and a specimen has been taken as far north as lat. 59°, and W. lon. 319°; it has also been taken in Tierra del Fuego.

As illustrations of the curious larvæ of the *Nymphaliniæ*, and no less curious angled chrysalids, there are figured two

Fig. 2.



Acynthia pimenta.

specimens from the work of Dr. Housfield. Fig. 2 is the larva of *Acynthia pimenta*; fig. 3 the pupa of the same.

To the *Nymphaliniæ* belongs the White Admiral, a rare British butterfly. The larva feeds on the honeysuckle. On Plate I., fig. 1 and 1A, is figured Mr. Hewitson's exquisite Amazon Butterfly (*Atagamma excelsior*), one of a set of truly gorgeous South American butterflies, the under sides of which are so curiously marked. Columbia is particularly rich in species. On Plate I., fig. 3, is figured *Epicalia pithia*, one of a genus the sexes of which differ greatly—so much so that the males and females of one species have been described as two species of two genera.

To this family belong many gorgeously decorated butterflies, the males of which are shot over with vivid purple, or with metallic green and blue. In this country we have one

of these, though it is confined to the southern parts—the Purple Emperor (*Apatura iris*). An insect from South America (*Apatura laura*), Plate II., fig. 7, is one of a set washed with silver on the under side, and having the finest “shot” of green and blue running over the greater part of the upper wings. The species figured on Plate II., fig. 6, is the *Agrias claudia*.

In the group Morphine are many of the largest and most brilliant of the butterflies. Although some of the group are found in Asia and the Asiatic islands, by far the larger number are peculiar to South America. Many of the species have on the upper surface large masses of shining blue on a dark ground, and the under side of the wings is ornamented with many “eye” spots. Some of the genera, such as *Cherone*, *Drusilla*, and *Thaumantis*, are peculiar to the Old World, being restricted to India and the Eastern Islands. Some of them seem to link this family to Satyrinae. One of these is figured *Drusilla megala* (Plate I., fig. 1), a native of the Louisiana Archipelago.

Fig. 1 shows the pupa, and fig. 5 represents the larva of *Amathusia phidippus*—one of the butterflies of the East Indian Archipelago.

The Morphos are forest insects, rarely coming into the open grounds, and often flying for miles along roads and

a sombre brownish-black colour, barred with yellowish brown; it flies very swiftly, and appears only early and late in the day.

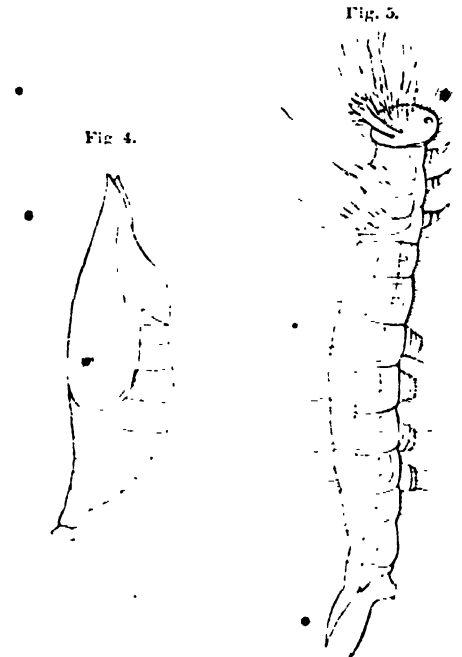
The insects of the group Satyrinae differ from the butterflies of the groups Morphine and Brassolinae, in having very long palpi, which are more or less erect and clothed in front with long extended hairs. They have a vast range, being generally scattered over the world; some of them, such as the species of *Chionobas*, are found in the Arctic regions—dusky, dull, brownish butterflies. There are more species of this family of butterflies in Europe than a third of the whole number of European diurnal Lepidoptera; they are generally of small or moderate size, and their prevailing colour is brown, hence the name of “Meadow Browns,” given to them by collectors. The under surface of the wings is generally ornamented with eye-like spots. The caterpillars almost exclusively feed on grasses, which accounts for their wide geographical distribution. They are not often seen, as they have the peculiar habit of feeding only at night. Some species, such as *Circ* and *Stenele*, retire into the ground to undergo their change into the pupa state.

3. The Erycinidae are a very extensive family of small butterflies, of which there is but one British, indeed European representative—the little fritillary-like “Duke of Burgundy,” as *Nemobius lucina* has been called.

In this family the male has only four legs adapted for walking. The larva is short, and shaped like a wood-louse. Plate II., fig. 9, represents the *Calyba calanysa*. South America is the metropolis of this group; some of these—particularly the long-tailed groups—have a brilliancy of colouring not exceeded by the species of any other family of butterflies.

4. The representatives of the family Lyceinidae in this country are commonly called “Blues,” “Coppers,” and “Hair-streaks,” from the prevalent coloration or markings. The wings are often marked beneath with eye-like spots, as in our “Blues,” which derive their generic name *Polyommatus*, or many eyed, from this style of marking. The hind wings have the outer margin often produced into one or more slender tails near the anal angle. The most distinguishing character of the family lies in the fore legs, which are evidently smaller in proportion than the rest, and nearly alike in size and shape in the two sexes; they are not brush-like in the males, but are furnished with a long jointless tarsus, having several curved hooklets at the tip. The fore legs of the females have the tarsus jointed like the hind legs. The hind legs are slender and scaly. The hind tibia has only one pair of spurs, which are sometimes very small. The caterpillar is short, broad, flattened, usually naked, and more or less closely resembling a wood-louse. The head is very small. The body is occasionally covered with fine hairs, or has the surface wrinkled. The chrysalis is short, thick, and blunt at each end, attached by the tail, and is girt by a silken thread across the middle of the body. In the British islands we have five species of the genus *Thecla* (“Hair-streaks”). The female is sometimes more brightly coloured than the male. Thus in the *Thecla quercus*, or Purple Hair-streak, the female has a rich purplish blotch on the wings.

5. The family Hesperiidae (Skippers) are generally small or of moderate size, of obscure colours, and often with transparent spots on the wings. In their flight they are very rapid, the eye being scarcely able to follow their movements. They are fond of the hottest sunshine, and in rapidity of wing they rival the hawk-moths. Our English collectors have given them the name of “Skippers,” from their peculiar flitting movements. The caterpillars are of moderate length, cylindrical, fleshy, and not spined. They have a large head and a narrow neck, and generally live in rolled-up leaves. The chrysalis is entire, and is generally without angular prominences. It is attached by the tail,



Amathusia phidippus.

open, the wings. Their flight is slow and undulating, but they are very difficult to take on the wing.

The group Hesperiidae is characterized by the very strong, bristly, and erect palpi, which are so closely appressed to the face that they appear, when seen from above, as if they were parts between the eyes. The fore legs of the caterpillars are brush-like, and have, as in the *Nymphalidae*, the bristles of the legs. The species are all inhabitants of the warmest regions of the New World. The caterpillars of a general disposition; it lives in companies of one hundred or more in a close web which it spins, and from the web it comes out only during the night to feed. The chrysalis is pale, spotted with dark red, and marked with four silvery spots; the butterfly is of

and is girt round the middle, being, however, sometimes inclosed in a slight silken cocoon among the rolled leaves. The chief character of the family consists in the middle legs having a pair of spurs in the middle of the hind tibiae, a character not met with in other butterflies.

Darwin, in the "Origin of Species," discusses the importance of butterflies in the theory of "mimicry":—"Certain butterflies imitate, as first described by Mr. Bates, other and quite distinct species. This excellent observer has shown that in some districts of South Africa, where, for instance, an *Ithomia* abounds in gaudy swarms, another butterfly, namely, a *Leptalis*, is often found mingled in the same flock; and the latter so closely resembles the *Ithomia* in every shade and stripe of colour, and even in the shape of its wings, that Mr. Bates, with his eyes sharpened by collecting during eleven years, was, though always on his guard, continually deceived. When the mockers and the mocked are caught and compared, they are found to be very different in essential structure, and to belong not only to distinct genera, but often to distinct families. Had this mimicry occurred in only one or two instances, it might have been passed over as a strange coincidence. But if we proceed from a district where one *Leptalis* imitates an *Ithomia*, another mocking and mocked species belonging to the same two genera, equally close in their resemblance, may be found. Altogether no less than ten genera are enumerated, which include species that imitate other butterflies. The mockers and mocked always inhabit the same region; we never find an imitator living remote from the form which it imitates. The mockers are almost invariably rare insects; the mocked in almost every case abound in swarms. In the same district in which a species of *Leptalis* closely imitates an *Ithomia*, there are sometimes other *Lepidoptera* mimicking the same *Ithomia*; so that in the same place, species of three genera of butterflies and even a moth are found all closely resembling a butterfly belonging to a fourth genus. It deserves especial notice that many of the mimicking forms of the *Leptalis*, as well as of the mimicked forms, can be shown by a graduated series to be merely varieties of the same species, whilst others are undoubtedly distinct species. But why, it may be asked, are certain forms treated as the mimicked and others as the mimickers? Mr. Bates satisfactorily answers this question, by showing that the form which is imitated keeps the usual dress of the group to which it belongs, whilst the counterfeiters have changed their dress, and do not resemble their nearest allies. We are next led to inquire what reason can be assigned for certain butterflies and moths so often assuming the dress of another and quite distinct form; why, to the perplexity of naturalists, has nature condescended to the tricks of the stage? Mr. Bates has, no doubt, hit on the true explanation. The mocked forms, which always abound in numbers, must habitually escape destruction to a large extent, otherwise they could not exist in such swarms; and a large amount of evidence has now been collected, showing that they are distasteful to birds and other insect-devouring animals. The mocking forms, on the other hand, that inhabit the same district, are comparatively rare, and belong to rare groups; hence they must suffer habitually from some danger, for otherwise, from the number of eggs laid by all butterflies, they would in three or four generations swarm over the whole country. Now if a member of one of these persecuted and rare groups were to assume a dress so like that of a well-protected species that it continually deceived the practised eyes of an entomologist, it would often deceive predaceous birds and insects, and thus often escape destruction. Mr. Bates may almost be said to have actually witnessed the process by which the mimickers have come so closely to resemble the mimicked; for he found that some of the forms of *Leptalis* which mimic so many other butterflies, varied in an extreme degree. In one district several

varieties occurred, and of these one alone resembled to a certain extent the common *Ithomia* of the same district. In another district there were two or three varieties, one of which was much commoner than the others, and this closely mocked another form of *Ithomia*. From facts of this nature Mr. Bates concludes that the *Leptalis* first varies; and when a variety happens to resemble in some degree any common butterfly inhabiting the same district, this variety, from its resemblance to a flourishing and little persecuted kind, has a better chance of escaping destruction from predaceous birds and insects, and is consequently often preserved; the less perfect degrees of resemblance being generation after generation eliminated, and only the others left to propagate their kind." So that here we have an excellent illustration of natural selection."

Some butterflies have two forms in the same species, one appearing in the early spring, and the other in summer. This phenomenon, to which Mr. A. R. Wallace has given the name of "seasonal dimorphism," was first noticed in the genus *Araschnia*. The winter form, *Araschnia levana*, is of a golden brown colour, with black spots and dashes, while the summer form, *Araschnia prorsa*, is deep black, with a broad white interrupted band across both wings. These two forms look so different that they were considered distinct species until the variety *Prorsa* was bred from the eggs of *Levana*, and *vice versa*. Weismann, in "Studies in the Theory of Descent" (1882), details experiments which he carried on for some years, and the conclusions at which he has arrived. The chrysalids resulting from the eggs of the *Levana* form, which appears in the spring, would, under ordinary conditions, develop into the summer form, *Prorsa*. From *Prorsa* another summer brood often arises, but the chrysalids from eggs laid in autumn always hibernates, and develop in the following spring into *Levana*. Weismann placed chrysalids of *Levana* into a refrigerator at a low temperature, and succeeded in producing butterflies, many of which, instead of being of the *Prorsa*, were similar to the *Levana* form. His explanation is that the form *Levana* is the original type of the species, and *Prorsa* the secondary form arising from the gradual operation of summer climate. The change of many of the summer brood into the winter form by means of cold can only depend upon reversion to the original or ancestral form. The reversion is most readily produced by cold—that is, by the same external influences as those to which the original form was exposed during a long period of time, and the continuance of which has preserved in the winter generation the colour and marking of the original form down to the present time. At the close of the Pliocene period there was a glacial epoch, during which the summers were short and cold, and as only one brood could be produced in the year, *Levana* alone existed. As the climate became warmer the summer was long enough for two broods to appear. But the *Prorsa* form did not originate suddenly, but gradually, as indeed the experiments show, for intermediate forms appeared; and, moreover, the last generation in the year always takes the *Levana* form, in spite of subjection to warmth. In such processes it is the constitution of the species, and not the external agency (warmth), which plays the chief part. Darwin compares the external agency to the spark applied to combustible material; the character of the combustion is due not to the spark but to the nature of the substance which it has ignited.

The importance of butterflies in biology has been well insisted on by Mr. Bates. They are "better adapted than almost any other group of animals or plants to furnish facts in illustration of the modifications which all species undergo in nature, under changed local conditions. This accidental superiority is owing partly to the simplicity and distinctness of the specific characters of the insects, and partly to the facility with which a very copious series of specimens can be collected and placed side by side for com-

poison. The distinctness of the specific characters is due probably to the fact that all the superficial signs of change in the organization are exaggerated, and made unusually plain, by affecting the framework, shape, and colour of the wings, which, as many anatomists believe, are magnified extensions of the skin around the breathing orifices of the thorax of the insects. These expansions are clothed with minute feathers or scales, coloured in regular patterns, which vary in accordance with the slightest change in the conditions to which the species are exposed. It may be said, therefore, that on these expanded membranes nature writes, as on a tablet, the story of the modifications of species, so truly do all changes of the organization register themselves thereon. Moreover, the same colour-patterns of the wings generally show with great regularity the degrees of blood relationship of the species. As the laws of nature must be the same for all beings, the conclusions furnished by this group of insects must be applicable to the whole of the world; therefore the study of butterflies—creatures selected as the types of ableness and frivolity—instead of being despised, will some day be valued as one of the most important branches of biological science."

BUTTERFLY-FISH (*Pomacentrus coelestis*), a BLUNNY inhabiting British seas, and also found in the Mediterranean. The body is long and without scales; the snout is very short, and both jaws are provided with long curved teeth. There is a single nasal fin occupying nearly the whole length of the back, and the spinous part is more developed than in the soft. On the hinder portion of the spinous part is a large round spot or "eye" (whence the specific name *Ocellatus*), of a dark black colour edged with white. It feeds on small crustaceans and the like, and is often found among pieces of sea-wood which have been left on the shore by the ebbing tide. The butterfly fish is figured in the Plate BLUNNY.

BUTTERFLY-PLANT. See ORCHIDUM.

BUTTER-MILK. See BUTTER.

BUTTER-NUT (*Juglans cinerea*) is a tree, a native of the temperate North America, and closely allied to the walnut (*Juglans regia*). It rises to a height of 40 or 50 feet; the bark is smooth, of a dark grey colour; the branches are long and spreading, forming a flat head; the fruit is a round berry. The inner bark of the root is used for making a mild cathartic, and is considered more useful than sculler-bark, in cases of habitual constipation. The brown dye extracted from the bark is inferior to that obtained from the walnut-tree. The ripe seeds are eaten, and the unripe fruit used for pickling. The wood is durable, and not liable to be attacked by insects.

BUTTERS, VEGETABLE, the name given to the extract of oil of certain plants, from its resemblance to the butter obtained from the milk of animals, and from being employed for similar purposes. The chief vegetable butters are produced by the *Bacca butyracea* and other species of *Bacca*. Kokum butter is obtained from the seeds of *Carissa carapapa*, carab butter from those of *Theobroma cacao*, and carab oil from *Carapa guianensis*.

BUTTER-TREE. See BASSIA.

BUTTERWORT. See PINGICULA.

BUT TISHOLZ, a village of Switzerland, in the canton of Lucerne. No event is recorded called the Terro Anglais, or English Barren, and to the grace of 3600 Englishmen, followers of De Cussy, an in-law of Edward III., who were defeated and slain there in 1376.

BUT TRESS. Gold, silver, brass, copper, pewter, mother-of-pearl, and wood, bone, ivory, horn, leather, paper, glass, silk, wool, cotton, linen, thread, are all formed into buttons, and the manufacture is carried on to a very great extent. Metal buttons with shanks are stamped out of a plate of the material, and each circular piece or "blank" is trimmed and smoothed. The shanks are made of wire by an ingenious machine, and are soldered on to the blanks. After

a little further preparation the buttons (if of the common gilt kind) receive a coating of gold [see GILTING], which is now often effected by the electro process. White-metal buttons, such as those on soldiers' dresses, are cast in moulds containing ten or twelve dozen, and the shanks are placed in the moulds previous to casting, so that when the buttons are cast the shanks are fixed at the same time. Mother-of-pearl buttons are cut out of the pearl shell by a cylindrical saw, and the shanks are fixed by a kind of dovetailed projection of the wire in a hole drilled in the shell through one-half its thickness. The finest shells used in the manufacture are called Macassar, and are worth from £110 to £160 per ton. Manilla shells are worth from £100 to £120, and those from Panama from about £20 to £30. The manufacture of pearl buttons is, however, declining. Glass buttons are also made.

The gilt-button trade commenced about a century ago. Covered buttons, made by machinery, were introduced at the beginning of the present century, and the flexible shank button was patented in 1825. Linen buttons for under-clothing were first manufactured in 1841. The use of loafs for the manufacture of horn buttons was afterwards begun in France, and these have been followed by the vegetable ivory button, a material of which several tons a week are now consumed in Birmingham. About 20 tons of metal are also used there weekly in the manufacture of buttons.

Buttons without shanks are made of mother-of-pearl, wood, bone, metal, &c., the metal ones being stamped, and the rest turned. They have holes through which the thread is passed to fix them on the garment. These holes are stamped in metal buttons, but they are drilled in those which are made of other materials. The holes are drilled while the buttons are in the lathe; long drills are made to converge towards the button, and thus the holes are all drilled at the same time. The buttons most extensively used at present are those covered with cloth or silk, the manufacture of which has arrived at great perfection. Most varieties of coat button now consist of two circular blanks of non, one of thick pasteboard, one of thick canvas, and one of silk or flannel. All these are cut out separately with great rapidity by a stamping press from sheets of the respective materials. Into a kind of die or cell is placed, first, the silk or flannel, then a disc or "blank" of iron, then the pasteboard, then the canvas, then the other piece of iron, all superposed. A stamping-press fixes all these together without the aid of any other mode of fastening.

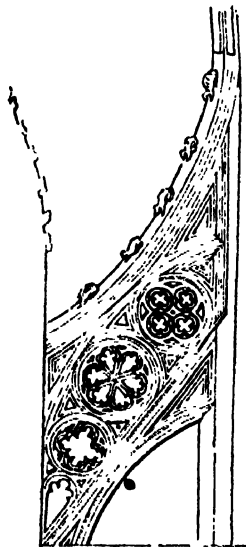
Buttons made of wire rings covered with thread or with linen, and metal buttons made indented by minute grooves, are among the many varieties of the manufacture. Buttons form a very large department of the industry of Birmingham, and large quantities are also imported from Germany, Holland, and France.

BUT TRESS, a vertical support to a wall, which takes the great lateral thrust of a heavy roof, the wall itself bearing the direct down pressure. Buttresses may be dispensed with where the walls are sufficiently thick, but they are both economical in saving expenditure on walls and highly decorative in themselves. Since the lateral thrust grows greater by increasing leverage from top to bottom of the wall, buttresses are usually finished with a sloping top, and are divided into several heights, each of which projects less from the wall as they ascend. The buttress is eminently a feature of Gothic architecture. The great roofs of Gothic cathedrals cannot be upheld by walls pierced with as many window openings as the northern demand for light requires. These weakened walls must be upheld from without. But the varieties of decoration and even of construction of buttresses are very numerous. Norman buttresses are plain broad faces slightly projecting from the wall of the building to which they belong. The top of these buttresses is terminated by an inclined plane

moulded underneath on the front face only. The bands which often occur in Norman buildings, as a sort of clapping to the basement of the wall, are often continued round the sides of the buttress. Of *Early English* buttresses four kinds may be distinguished. The first is a flat buttress, narrower than the Norman, with mouldings more delicate, but very similar to and hardly to be distinguished from the Norman. The second is a buttress projecting at times as much as (sometimes more than) its breadth. The third kind consists of long slender narrow buttresses, with a considerable projection divided into several heights. The fourth kind of buttress of this period, and perhaps the latest, is divided into stages or divisions receding one behind the other; but this is not common.

The *Decorated English* buttresses which succeeded these present many varieties. A splendid example of rich buttresses of the decorated style is found in the west front of York Minster, shown in our Plates on *ENGLISH CATHEDRAL ARCHITECTURE*; and in the same Plates are specimens of buttress decoration from Lincoln Cathedral and from Henry VII.'s chapel, Westminster Abbey, showing the difference between the purer Gothic and the later florid or flamboyant style in this particular. The decorated buttresses are enriched with panels, niches, and a variety of ornaments. When the buttress, instead of supporting a

wall from the ground, supports one wall from another wall, it is called a *flying buttress*. Of this sort are the fine flying buttresses which support the tall slender walls of the choir of so many wonderful Gothic minsters. Springing from the walls of the small chapels which surround the choir and complete the line of the aisles, as the choir does that of the nave, these flying buttresses are thrown across in mid air to perform their office. The effect is one of the most imposing in the range of architecture. Octagonal turrets are sometimes used, as in Henry VII.'s Chapel at Westminster, for support, whence the flying buttresses may spring. The most superb construction of this kind ever executed in this country belongs to this edifice. The whole chapel is given in half elevation and section,



Flying Buttress, from Henry VII.'s Chapel, Westminster.

clearly showing the construction, in our Plates on *ENGLISH CATHEDRAL ARCHITECTURE*. It is perhaps hardly necessary to call attention to the absurd misuse of buttresses in positions where they are not required. Such excrescences of supposed decoration are, unhappily, found in modern buildings on every side.

BUTYRIC ACID ($C_4H_8O_2$), a colourless, liquid, fatty acid which exists in butter. It is also found in coal-liver oil, in perspiration, and in animal juices in combination with lactic acid. It combines with water, and evaporates readily in the open air. In butter it is combined with glycerine, and the compound is inodorous. Decomposition results from long standing or exposure, and the butyric acid is set free, giving rise to the peculiar offensive odour of rancid butter. It boils at $157^\circ C.$ (315°Fahr.), and distils without decomposition. Its density is 0.9739. It is very soluble in water and alcohol. It also combines with chlorine and bromine, giving chloro and bromo butyric

acids. It combines with different bases to form salts, called *butyrates*, few of which are of importance.

BUTYRIC ANHYDRIDE (C_4H_6O) is a colourless mobile liquid, of specific gravity 0.978, boiling at $190^\circ C.$ (374°Fahr.)

BUTYRIC ETHER or **BUTYRATE OF ETHYL**. This substance is known in commerce as artificial essence of pine-apple, or pine-apple oil, and is much used in perfumery and confectionery. It has an agreeable odour and sweetish taste. The flavour of pine-apple, melons, and pine-apple rum is due to the presence of this ether, which in the latter case is gradually formed by combination in keeping the spirit. It is a colourless liquid, boiling at $119^\circ C.$ (246°Fahr.). Its specific gravity is 0.9019 and its composition $C_6H_{12}O_2$.

BUTYRIN, a slightly yellow oil, insoluble in water, but soluble in alcohol and ether. It exists in butter, with caproin, olein, and margaric, and has the smell of butter when heated. It can be prepared artificially, and is derived from butyric acid and glycerine. Three compounds are known: monobutyric ($C_7H_{14}O_4$), dibutyric ($C_{11}H_{22}O_6$), and tributyric ($C_{15}H_{30}O_8$).

BUXBAUMIA is a genus of Mosses. It was named in honour of J. C. Buxbaum, a German botanist. The capsule is out of all proportion to the vegetative part, which is sometimes reduced almost to nothing. The peristome is double, the outer teeth irregular, the inner a plicate membrane. There are two species found in this country, both rare. *Buxbaumia aphylla* was first discovered in Great Britain at Sparacaton, near Norwich. It has also been found in three or four localities in Scotland. *Buxbaumia indusiata* has been found in Scotland.

BUXTON, a favourite inland watering-place in the county of Derby, lies in a deep valley on the west bank of the Wye, 33 miles N.W. from Derby, and 164 from London by the Midland Railway. It is surrounded by bleak hills and extensive tracts of moorland. The old town occupies the highest ground, and has the remains of a cross in the centre of the market-place. The Crescent in the new town is an extensive and elegant structure, three stories high, of which the basement story has a piazza 7 feet wide within. Besides containing some of the baths for which Buxton has been celebrated from the time of the Romans, the Crescent comprises two hotels, a library, an assembly room, a news-room, and a few private residences. At the west end of it stands the old hall built by the Earl of Shrewsbury, in the reign of Elizabeth, in whose custody Mary Queen of Scots was placed; she being occasionally permitted to visit Buxton, occupied apartments in it. The Crescent was erected in 1781 by the Duke of Devonshire, at a cost of £120,000. The church is an elegant modern structure. The town contains a very tastefully laid-out pleasure garden, in which is a large pavilion for concerts, &c. Another concert-hall of huge dimensions was also opened in the town in 1876. The public baths of Buxton are numerous, and are hot, tepid, and cold. The hot spring has a temperature of 82°Fahr. , which never varies. A gallon contains 10.4 grains of carbonate of lime, 2.4 grains of hydrochlorate of soda, 1.5 cubic inches of carbonic acid gas, and 1.64 cubic inches of nitrogen gas. The season commences in June and ends in October. The environs of Buxton abound in natural curiosities. Near the lime quarries is Pool's Hole, said to be thus called after a famous outlaw who made it his residence in the time of Henry IV., an immense natural cavern covered with stalactites, which have a very brilliant appearance when lighted by the guides who show the cave; beyond this is the Diamond Hill, so named from the profusion of well-defined hexagonal crystals dispersed through the soil. There is also a chalybeate spring, issuing from a chalk stratum behind the Crescent, which has a building over it, and is occasionally drunk; when mixed with that of the

other springs it forms a purgative. These mineral waters are on the western edge of the limestone range which occupies that portion of Derbyshire called the Peak Forest, extending from Castleton southwards, and consisting of alternate beds of limestone and amygdaloid (road-stone), the former abounding in fossils. A large fault traverses the whole, and in this dyke the thermal springs both of Matlock and Buxton rise—the latter being at the S. end of the out-cropping of the lowest limestone bed. In Peak Forest is a small church, dedicated to “St. Charles, king and martyr,” built here about 1660. The benefice was a “peculiar,” and possessed rights of granting marriage licenses. It became the Greta Green of the Midlands. There are voluminous registers of “foreign marriages,” averaging sixty per annum. These scandalous marriages, solemnized without any inquiry whatever and at a moment’s notice, were to a great extent curbed by the Fleet Street Marriage Act of 1753. Three miles S.W. of Buxton is Axe Edge, 1810 feet, the second highest summit in the county. Buxton is situated near the crossing of two ancient military roads, and vestiges of a Roman bath and many Roman coins have been found. In the time of Henry VIII. we find the practice of offering up crutches or articles of attire to the image of St. Anne, by those who had been cured by the waters, prohibited. Population, 6021.

BUZZARD (*Buteo*) is a genus of birds belonging to the order ACCIPITRIS.

The Common Buzzard (*Buteo vulgaris*) is common in all the wooded countries of Europe, and passes over the Mediterranean into North Africa. It also exists in Western Asia, and a nearly allied species is found in the Himalaya Mountains. It is now rather rare in Great Britain. It measures about 20 inches in length; the plumage of the upper parts, the neck and breast, are of a dark-brown colour; the throat and belly are grayish brown, spotted with dark brown; the tail is grayish brown, with ten or twelve dark-brown transverse bars; the back lead colour;



Common Buzzard (*Buteo vulgaris*).

the cere and legs yellow. The beak in the buzzard is short and stout, compressed on the sides, and has the margins of the upper mandible sinuated; the nostrils are large; the wings long but obtuse; the tail of moderate length and rounded; the tarsi rather long and stout, covered with scales in front, as are also the toes; the remainder of the foot is reticulated, and the claws are long, strong, and acute. The buzzard is rather an inactive bird, but often soars to a great height, and sails in circles like an eagle. When in pursuit of prey it glides over the fields, at no great distance from the ground, and pounces down upon any articles of food that come within its ken.

Its food consists of small birds and the young of the grouse and partridge, mice and other small mammals, reptiles, insects, and even earthworms—all of which it captures in the way above described, very rarely pursuing its feathered prey when on the wing. Mr. McGillivray states that he once found the stomach of a buzzard filled “with leaves of plants and roots, along with beetles and an earthworm.” After feeding it retires to some secluded spot, and there reposes until the food is digested, and its returning appetite again suggests to it the necessity of exertion. The nest of the common buzzard is composed of sticks and twigs, mixed with heath, and lined with wool and grass. Its position varies according to the nature of the country inhabited by the birds; in rocky districts it is built on the ledges of the rocks, and in the more undulating and wooded localities amongst the branches of trees; but the material and construction of the nest are the same in both cases. These birds are said to save themselves part of the trouble of building by taking possession of the nest of a crow and enlarging it to suit their purposes. In these nests the females deposit from three to four eggs, which are of an almost perfectly oval form, and of a dull or slightly bluish-white colour, sometimes nearly spotless, but usually spotted with rusty brown.

Buzzards are said to attend to the wants of their young for a longer period than most predaceous birds, and they certainly possess very strong parental instincts. In captivity female buzzards have been repeatedly known to hatch the eggs, and bring up the young of other birds.

The Rough-legged Buzzard (*Buteo lagopus*), figured in Plate I., ACCIPITRIS, differs from the common buzzard in having its tarsi covered with feathers down to the toes. It is rare in Great Britain, being found chiefly in the more northerly regions of both hemispheres. In the winter it migrates as far south as the Cape of Good Hope. In its general habits it resembles the common buzzard.

The Angur Buzzard (*Buteo angur*) is an exceedingly common bird in Abyssinia, where, as its name imports, it is regarded by the inhabitants as furnishing important omens to those about to set forth on a journey. According to Salt, the Abyssinians, on meeting one of these birds at the commencement of a journey, watch it very carefully, and draw good or bad omens from its motions:—“If it sit still with its breast towards them until they have passed, it is a peculiarly good sign, and everything is expected to go well during the course of the journey. If its back be turned towards them it is considered an unpropitious sign, but not sufficiently so to create alarm; but if it should fly away hastily on their approach, some of the most superstitious among them will immediately return back to their homes, and wait till a more favourable opportunity for commencing their expedition occur.” Dr. Roth states that he never found anything but locusts in its stomach; but, according to Dr. Rüppell, it feeds upon small birds and bats, and pursues the latter chiefly when roused from their retreats by the passage of caravans or other large bodies of men, which it frequently accompanies or precedes. To this circumstance Rüppell ascribes the belief in the faculty of divination supposed to be possessed by this bird.

BY-LAW. By-laws are the regulations of a corporation, agreed upon by the major part of the members, for more conveniently carrying into effect the object of the institution.

It is not every voluntary association to which the law of England gives the power of binding members by the rules made by the majority. Immemorial custom or prescription, or legal incorporation by the king, or some Act of Parliament is necessary to confer the power of making by-laws; and even in those cases the superior courts of law can take cognizance of the by-law, and establish its legality or declare it to be void. In order to stand this test, a by-law must be reasonable and agreeable to the law of England.

The power of making by-laws is in some instances lawfully exercised by a class of persons having no strict corporate character. Thus the tenants of a manor, the jury of a court-leet, the inhabitants of a town, village, or other district, frequently enjoy a limited power of this kind, either by special custom or common usage. But in general the power is exercised only by bodies regularly incorporated, and in such bodies the power is inherent, without any specific provision for that purpose, in the charter of incorporation.

Our own term *by-law* is of Saxon origin. The modern German *beilage*, "addition" or "supplement," is just the same word as *by-law*; and the prefix "by" is common in the English language. In German the equivalent prefix "bei" is still more common.

The Act for the regulation of municipal corporations, 5 & 6 Will. IV. c. 76, gives to the town-councils a power of making by-laws for the good rule and government of the boroughs, and for the suppression of various nuisances; and of enforcing the observance of them by fines limited to £5. Such by-laws, however, are not to be in force till the expiration of forty days after the same, or a copy, shall have been sent to one of the secretaries of state, during which period the sovereign, acting by advice of the Privy Council, may approve of the whole or a part, or disallow altogether such by-law, or enlarge the period during which it must not come into operation.

Under the Joint-Stock Companies' Act, 7 & 8 Vict. c. 110, s. 47, 48, and the Companies' Act, 1862, provision is made for registering by-laws of such companies, as a condition of their being in force.

Railway companies have also always the power of making by-laws, subject to the approval of the Board of Trade.

In Scotland there is very little common law on the subject of by-laws. The institutional writers say generally that every corporation or other community is at liberty to make its own by-laws, provided they do not infringe on the law of the land; but there are hardly any precedents on the subject.

BYNG, GEORGE, VISCOUNT TORRINGTON, British Admiral, eldest son of John Byng of Wrotham, in Kent, was born on the 27th of January, 1663. He entered the navy at fifteen years of age, and soon distinguished himself. In 1688 he was particularly active in attacking the fleet to the interests of the Prince of Orange. He commanded a third-rate in the successful expedition to Vigo in 1702, and received the honour of knighthood after the battle of Malaga in 1704. In 1718 he totally defeated a Spanish fleet off Messina, for which he was rewarded with some of the highest professional honours, and created Baron Byng of Southill in the county of Bedford, Viscount Torrington in Devonshire, and first lord of the Admiralty, in which exalted station he died 17th January, 1733.

BYNG, ADMIRAL JOHN, fourth son of Viscount Torrington, the subject of the preceding article, was born in 1704, and entered early into the naval service, in which he made the usual progress through subordinate stations. In 1756 he was appointed admiral in command of a squadron of ten ships of the line in the Mediterranean, destined for the relief of Minorca, at that time menaced by the French. For his conduct in this command, having, as was alleged, avoided bringing the French squadron to a decisive action, Byng was accused of cowardice, and brought to a court-martial. Party feeling was strongly exerted against him, and after a long trial he was found guilty of not having done his utmost, sentenced to be shot, but unanimously recommended as a proper object of mercy. The intrigues of his political enemies, however, prevailed; the press was employed against him; and, in spite of many representations in his favour, the sentence was executed at Portsmouth on 17th March, 1757.

Byng met his fate with calmness and fortitude, and posterity has done ample justice to his memory. It is said

that Pitt protested against the death of Byng, yet was not inclined to risk his popularity by pressing his objection to the extreme. Voltaire said satirically in "Candide," that Byng was shot "to encourage the rest."

BYRD or BIRD, WILLIAM, who is numbered among the most celebrated of our older ecclesiastical composers, was born about the year 1510, and educated as one of "the children" in the Chapel of Edward VI. In 1563, he was chosen organist of Lincoln Cathedral, and in 1575 became organist to Queen Elizabeth. He died in 1623. Byrd seems to have been highly esteemed, both in his private and professional capacity. That he was great in his art, at a time, however, when that art exhibited more of study than genius, his compositions afford indisputable evidence. His "Complete Service," together with three Full Anthems, published in Boyce's "Collection," prove his musical learning. He contributed largely to Queen Elizabeth's "Virginals Book." He also published other works, chiefly with Latin words, all of them displaying deep study and a profound knowledge of florid counterpoint. But he is now generally known—is, in fact, well known everywhere—by his canon "Non nobis, Domine." Some attempts have been made from time to time, particularly on the Continent, to tear so valuable a leaf from Byrd's laurels, but he is still left in full possession of this rich and never-fading ornament.

BYRON, LORD, GEORGE NOEL GORDON BYRON, was born on the 22nd of January, 1788, in Holles Street, London, where a tablet on the house records the fact. Notwithstanding his ancient lineage, Byron, from the imprudence and vices of his father (Captain Byron, nephew to the then lord), was born and brought up in poverty. Owing to an accident attending his birth one of his feet was distorted—a defect which was a source of pain and mortification to him during the whole of his life.

In 1790 his mother, who had separated from her husband, retired with her child to Scotland, her native country. His father died abroad in 1791. His mother was not at all fitted to correct those hereditary vices which Byron, in after years, was accustomed to say were strong within him. She even used to sting him into fury by taunts on his lameness. When about five years old Byron was sent to a day-school at Aberdeen. He was then placed under the tuition of Mr. Ross, a Scotch clergyman, who taught him to read, and afterwards of Mr. Paterson, who taught him a little Latin. He next went to the free grammar-school of Aberdeen, where he was studying when the death of his grand-uncle recalled him to England, and to the enjoyment of such a provision as suited a peer of the realm in his minority. In 1798, when the poet succeeded to his great-uncle's titles and estates, he was little more than ten years old. His mother immediately removed to Newstead Abbey. After two years of a quiet boarding-school Byron was removed to Harrow, where he remained till 1805, when he was sent to Cambridge. During his stay at Harrow he was irregular and somewhat turbulent in his habits; but of a frank, noble, and generous spirit, which endeared him to his school-mates. When about fifteen years old he became acquainted with Miss Chaworth, the heiress of Annesley and descendant of the Mr. Chaworth whom his lordship's great-uncle had killed. He had fancied himself in love two or three times before; but this more than half-imaginary passion for Mary Chaworth seems to have haunted him almost to the last hours of his existence, and he always persisted in saying that had he been united to her he should have proved a better and a happier man.

In October, 1805, he went to Trinity College, Cambridge, where he spent two years in the way that was not uncommon with young men of rank and fashion. In 1806 he painted a very thin quarto volume of poems for private circulation. In 1807 he brought out his "Hours of Idleness," which was very severely handled in the *Edinburgh Review*. It

was a collection of fugitive pieces, which evinced no very high ability, and the severity of the reviews seems to have produced a good effect on his lordship's muse. He collected his powers, took more pains with his style, and in 1809 brought out his well-known satire, "English Bards and Scotch Reviewers," which, however faulty in parts as a composition, and blamable in moral feeling, was a very great improvement on his preceding productions. A few days before the publication of this satire he took his oath and seat in the House of Lords. He delivered two set speeches in the Lords with indifferent success, and then his senatorial ardour cooled altogether. In 1809 Lord Byron, in company with Mr. John Cam Hobhouse, left England to travel in Portugal, Spain, Greece, Turkey, &c. His travels finished his poetical education, and nearly everything he wrote afterwards is tinged with the glowing atmosphere of the East. In March, 1812, Byron published the first two cantos of his splendid poem, "Childe Harold," which at once gained him the very highest name among the poets of the day. The popularity of this production was as limited as it was great, and he used to say, that he went to bed on the 1st, and on waking the next morning found himself a hero. To pass over some minor productions, it was in 1813 that his wild Oriental tale, "The Giaour," first appeared; this was followed in December of the same year by "The Bride of Abydos," another passionate Eastern poem. In 1814 he published his "Corsair," one of the most applauded of his productions. In 1814 he published his ode on the first fall of Bonaparte. In the same year appeared his "Lara," an irregular sort of sequel and wind-up to the "Corsair," written in much the same style, but with rather less power. During the blaze of his poetical fame, and his intoxicating success in society, Byron was hardly ever happy.

In 1814 he was married to Miss Milbanke. An utter incompatibility of character between him and his wife anguished him for this last-formed alliance. On the 10th of December, 1815, Lady Byron bore him a daughter, the Adieu of his poems afterwards Lady Lovelace; and at the end of January following she left his house with her infant, and retired to her father's residence in Leicestershire; the poet never saw his wife or child again.

At the end of February, 1815, he published his two poems, the "Siege of Corinth" and "Parisina." In the April following he set sail for Ostend, with a determination never more to return to a country which had given him no peace, titles, competent wealth, and fame. He took up his residence for some time at Geneva, his favourite continental residence there being Shelley the poet and his wife. During his stay at the Villa Diodati, near Geneva, he wrote the third canto of "Childe Harold," "The Prisoner of Chillon," "The Dream," and several of his fugitive pieces. In 1820 he took up his residence at Ravenna, where he involved himself with secret societies and Italian plots to overthrow the government of the pope. The brother and other near connections of the Countess Guiccioli, a married woman to whom he had attached himself, were so seriously committed that the Papal government expelled them from the states of the church. Upon this the lady and her relatives took refuge in Turin, and ultimately lived themselves at Pisa, where Byron followed them in November, 1821. He then took up his abode in that town, where he was joined by Mr. and Mrs. Shelley, and Mr. Leigh Hunt and family. Byron, Shelley, and Hunt started a work called *The Liberal*. After the irregular appearance of two or three numbers the work stopped.

Early in 1823 he received overtures from the committee of friends to the Greeks established in London for the purpose of aiding that people in their struggle for independence. After a short correspondence with the committee he determined not merely to act in person, but in person, and with arms in his hands. Before this he had written

the fourth canto of "Childe Harold;" "Beppo, a Venetian Story;" "Mazeppa;" "Manfred;" "The Lament of Tasso;" "Ode to Venice;" "The Prophecy of Dante;" "Cain, a Mystery;" "Marino Faliero;" "The Two Foscari;" "Sardanapalus," and "Werner," tragedies; "Don Juan;" "The Vision of Judgment," and many fugitive pieces. With his head full of warlike notions Byron sailed from Genoa on the 14th of July. On the 24th he reached the island of Cephalonia. He showed a talent for public business that surprised most people, and a degree of good common sense that contrasted very advantageously with the wild theoretic dreamings of many of the Philhellènes who had repaired to Greece. At the end of December, 1823, Byron sailed from Cephalonia. He reached Missolonghi on the 10th of January, 1824, where he found everything in a most perplexing and almost hopeless state of anarchy and confusion. He set to work with spirit and application, and again showed a great aptitude for the despatch of public business. The weather was detestable, and the place unhealthy. Byron fell ill from exposure and worry, and by the middle of April he was evidently in danger. For several days he obstinately refused to let his medical attendants bleed him, and when he gave his consent the bleeding was too late. Inflammation extended to his brain, and he expired 19th April, 1824, being only thirty-six years and three months old.

As a poet of description and passion Byron will always occupy a high place. The least successful of his productions, notwithstanding the admirable passages in which they abound, are his tragedies; the work which gives us the highest notion of his genius, power, and his versatility is his "Don Juan;" that most generally in favour is the "Childe Harold."

In 1869 the Countess Guiccioli, Byron's former mistress, published "Reminiscences of Lord Byron," in which she represented him as a man endowed with every natural charm, gift, and grace, but who, by the one false step of an unsuitable marriage, had wrecked his whole life. The publication of this work led Mrs. Beecher Stowe to write "The True Story of Lady Byron's Life" in *Macmillan's Magazine* for September, 1869. The *Quarterly Review* for October, 1869, and January, 1870, continued the controversy, which excited considerable attention at the time. It is felt now that Mrs. Stowe's action was quite indefensible. Mr. Joadreson's book, "The real Lord Byron" (London, 1883), has fortunately disposed of her hideous accusations once for all. A statue of Byron by the sculptor Belt was erected in London in 1880.

Byron's works are continually being reprinted in various editions and selections. The best is that published by Murray. Swinburne has issued the best selection, published by Moxon, with a fine preface (1880). The latest good selection is that by Matthew Arnold (Macmillan, 1881). A good sketch of the poet's life and works, of the same date as the last named, forms part of "English Men of Letters."

BYRONIMA is a genus of plants belonging to the order MALPIGHIACEÆ. There are about ninety species, natives of tropical America. They are trees or shrubs, with opposite leaves and connate stipules.

Byronima spicata, a tree 30 or 40 feet high, grows in Brazil and the West Indies. The small yellow berries are produced in great abundance, and are pleasantly acid; they are astringent, and are found useful in attacks of dysentery. From the bark a dye of a maroon colour is prepared, and Mr. Bates says that "coarse cotton shirts tinted with it were the distinctive badges of the native party during the revolution." The bark is also used by tanners. In Brazil this tree is known under the name of Muri-hi. Many other trees belonging to the genus have similar properties; some of the shrubs are climbers.

The flowers are generally yellow, and are produced in racemes at the ends of the branches. The calyx has ten glands. There are ten perfect stamens, which at the base

are hairy and connected, and three distinct terminal styles with acute stigmata. The fruit is like a cherry, with a three-celled stone.

BYSSUS is the name applied to the long tuft of silky threads by which some of the Lamellibranchiata (such as mussels) are moored to submarine rocks. These threads are moulded by the foot from a viscous material secreted by a special gland. The byssus in the great Pinna of the Mediterranean is largely developed. It is manufactured in Italy into various articles, as gloves, &c., of which specimens are preserved in many museums. The byssus or beard of the mussel is familiar to all. Springing from a hollow at the top of the mollusc, it takes a firm hold of the rock to which it clings. In an allied genus, Anomia, the byssus takes the shape of a plate-like plug, which passes through a hole or notch in the right valve of the shell, and attaches the animal to some foreign body.

BYSSUS (Gr. *Bussos*). Investigations have determined that byssus is linen, at least so far as the term has been applied by Greek and Roman writers to mummy-cloth. Herodotus states that the Egyptians wrapped their dead in the cloth of the byssus; and it has been shown, by microscopic observations, that every specimen of mummy cloth yet examined is made of linen fibre. The name byssus came probably from the Phœnicians, and may be derived from *בִּיט*, bitz (Buxtorf's "Lexicon"). It is possible that writers later than the time of Herodotus may sometimes have applied the term indifferently either to cotton or linen cloth. Cotton was known in the time of Herodotus (B.C. 481-408), who calls it tree-wool; but there is no evidence to prove that it was then cultivated in Egypt or in any other country except India, or that it was in common use in Egypt.

BYZANTINE ARCHITECTURE, SCULPTURE, PAINTING, and MOSAIC. When Constantine the Great adopted the Christian faith as the religion of the state, the arts, always handmaids of religion, at once developed from the new Christian standpoint. But the method of development in the two great peninsulas of the empire was very markedly different. In Italy arose **BASILICAN ARCHITECTURE**, but in Greece, where Constantinople had been selected as the chief city of the new emperor, **Byzantine architecture** sprang into existence. With such different architecture, however, the other arts still remained greatly similar, and the reason is not far to seek. The Romans had been great builders always, but artists never. Nearly all, if not quite all, artistic work in Italy was the work of Greek hands; and when the revival of art began it will be remembered that Niccolò Pisano, the first Italian sculptor, learned how to work from observing the work of the Greek sculptor-masons at Pisa. It is therefore quite common, and at bottom true, to speak of early Christian Italian art as Byzantine, since it is not only thoroughly imbued with all its virtues and with all its many vices, but is certainly for the most part, and perhaps entirely, by the same artists. The mosaics of St. Paul's at Rome and Santa Sophia at Constantinople are of the same school. We owe a deep debt of gratitude to the Byzantines; for during the terrible period of the dark ages the lamp of Greek literature and art burned, however dimly and smokily, in the ever-shrinking dominions of the worthless Eastern Empire; and when in 1453 the Turks contemptuously scattered the effete government to the four winds, a little crowd of men of letters and of art fled to Europe and inaugurated the stirring period of the Renaissance. In Byzantine art alone remained some sense of the Greek ideal, and some tradition of the Greek workmanship, although stiffened into pedantry and sharpened into rigidity.

But while in happier times, before the empire was dismembered, Greek and Italian early Christian art were identical, and may both be fairly called Byzantine, it is not so with the architecture. The long nave and aisles ending

the tribuna or apse; the straight entablature pierced by the clerestory, and supported by a vast perspective of columns; the wooden roof, often flat—these are the well-known characters of the **BASILICAN**, and have been described elsewhere. Byzantine architecture is of quite another style. The plan of the old Basilica of St. Peter's at Rome, on the site of which the present cathedral stands, is given in our **PLATE ON BASILICAN AND BYZANTINE ARCHITECTURE**; and in the same **PLATE** there is an equally characteristic plan and elevation of the chief glory of Byzantine architecture, the present mosque and ancient cathedral of Santa Sophia at Constantinople. A church had been erected to "The Holy Wisdom" (Santa Sophia) by Constantine, but it was twice destroyed by fire. Justinian determined to erect it afresh in a style which would immortalize his reign (527 to 565). Of the art of the two centuries between Constantine and Justinian nothing remains at Constantinople; but the large colony of Romans whom the first Christian emperor had invited to his new capital had evidently not been working in vain, for in the Church of the Holy Wisdom some of the most difficult problems of construction are presented and solved in a masterly style. The architects were Anthemius and Isidore the Milesian; and in the slavish manner of the period they confess (as we find recorded in Procopius and in Agathangos) that "their own meditations were surpassed by the intuitive knowledge or rather inspiration of an emperor whose life existed for the benefit of his people and the salvation of his soul." Ten thousand workmen accomplished the task by 537, in just under six years, and Justinian cried, "I have vanquished thee, O Solomon!" An earthquake some twenty years later necessitated a rebuilding of the eastern part of the dome; but so solidly was the general structure built that it yet stands unimpaired, and has been a model for Mohammedan mosques and Greek churches for centuries. No wood except for doors was allowed to be used, in memory of past disasters; but to gain lightness for the dome a mixture was employed of pumice stone and Rhodian bricks, the one floating on water, and the other but a fifth of the weight. With such materials was built the great cupola. The brick cone of the outer building and the stone piers of the dome-space were wholly encrusted with marble and precious metals, and contemporary poets celebrate the blaze of splendor of the interior, and the varied glow of a dozen different coloured marbles.

The chief peculiarity of the type of edifice, of which no doubt Santa Sophia was the outcome and flower, though it now remains as the earliest example extant, is the employment of the cupola or flat dome as the roof of the main part of the building, and of an almost square ground-plan, in lieu of the long nave with its imposing vista of columns and flat or domed roof of the basilicas. The cupola of Santa Sophia is circular in plan, but it rests on the crowns of four great arches, rising one on each side of a square, and the east and west sides of the square are continued by two large half-domes or apses. Smaller apses at a yet lower level are introduced; and vaulted aisles to north and south fill out the entire ground-plan to an almost true square. The dimensions are 229 feet N. to S., and 213 feet E. to W. The external appearance is somewhat confused, as may be imagined; but of the interior the most competent judges of all times speak with great admiration. Thus the contemporary Procopius admires the dome, hanging "as if suspended by a chain from heaven;" and one of the latest of our great architects, Sir Gilbert Scott, "cannot conceive of anything more astonishing, more solemn, and more magnificent" ("Lectures on Mediæval Architecture"). The great beauty lies in the intricacy of design and the continual gradation of parts from the small arches to the stupendous dome, each curve opening out into a larger one, and yet the whole system visible at a glance. The dome itself is wonderfully light and floating in effect. Its

diameter is 107 feet clear, and its rise 46 feet; from floor to summit the height is 182 feet; all round its base it is pierced by forty windows, so close together that the dome seems scarcely to have any solid support. The half domes are all similarly pierced by windows. The interior of a Roman basilica carries the eye onward to the apsidal termination; but it is evident that the construction above described arrests it on the central portion of the building. Yet perspective effects are by no means neglected, as they are in the circular and octagonal style of churches. While the eastern end of the church is apsidal the western ends in a square recess, giving access to the two-storied *narthex*, or place for the penitents. The women worshipped in the north and south galleries, which, supported by light columns, filled up the great side arches of the church with their two floors each. Eastward of the great dome-space a balustrade, running from the throne of the emperor to that of the patriarch, divided the choir and the altar from the congregation, and was the parent of the well-known screen of the Greek orthodox Church.

The great feature, externally, of Byzantine churches was, then, the dome springing from a square, with other domes or half domes clustered round; and internally, the central domed space, with galleries for the women all round, except in the altar-apse. The splendid Cathedral of St. Mark's at Venice, built between 977 and 1071 on designs sent from Constantinople, is far better known to us as a model of Byzantine architecture than the purer example of Santa Sophia. St. Mark's has a large central dome with four subsidiary domes grouped round it (the domes are really hemispherical, although later roofs have been added over them of a bulbous shape); thus its ground-plan is an equal-armed or Greek cross, somewhat of an approach to Western models in this point. But the square ground-plan is even then adhered to, and side aisles, roofed with several small flat-tiled domes, fill up the corners between nave and transept. Much of the original glory of St. Mark's still exists, though dimmed by age; and it is so familiar and so beloved a work of art that any further detail is unnecessary in this place. The contemporary Church of Theotokos (Mother of God) at Constantinople, and the wonderfully fine San Vitale at Ravenna hardly later than Santa Sophia itself, must be mentioned as other highly characteristic examples. May we between these groups count the noble circular church at Aix-la-Chapelle (796-804), admirably illustrative of the Byzantine style.

The Romans had used the Greek architrave and column in a curious and not pleasing combination with the arches and vaulted roofs in which they excelled. This was carried to the worst excess in the architecture of the Emperor Diocletian, in whose baths at Rome we find the vaulting starting from a column surmounted with a fragment of sculpture containing architrave, frieze, and cornice. And in whose palace at Spalatro (see PLATE BASILICA AND BYZANTINE ARCHITECTURE) the arches spring from the capitals of columns. The design was to gain richness even at the sacrifice of artistic truth and appropriateness; and indeed this palace, dating from the fourth century, is of extreme magnificence, covering a square of some 750 feet to the side, full of picturesque effects of columns and arches, but nursing the seeds of decadence of a very noble style. The fall from the classic simplicity which Diocletian's palace shows is almost exactly paralleled by the recent development of the tasteless Bernini and his followers, under Louis XIV. and Louis XV., from the noble revival of Bramante and Borromini. In contrast with this unwarrantable alteration of a formed style the Byzantine architects, adopting the dome and not the column as their main feature, invented new details in accordance with this style. And first the Greek entablature or cornice is quite banished from the plan, and the form of capital which in the classical style is concave becomes either

slightly convex or simply conical or trapeziform. The acanthus is still used, but only as one design amongst others; quaintness and angularity, possibly in contrast to the circular arches and domes of the general construction, are sought after. Mosaics and frescoes take the place of carvings and mouldings on the inner surfaces, colour replaces the light and shade of skillfully varied masses.

Traces of Byzantine influence in France and Spain are still existent, but the main developments are, (a) the modern Greek churches, which really simply continue the style with the alteration of the semicircular dome into a bulbous form; and (b) MOORISH ARCHITECTURE, a charming style far surpassing its original, which is treated in its proper place.

Sculpture.—Christianity brought with it at first a horror of sculpture as applied to religious forms, born of the reaction from the superstitious worship of images by the heathen temple votaries. But as paganism became a thing of the past sculpture and painting gradually took their proper position, beginning with the decoration of tombs. A very perfect example exists in the crypt (*Sagre Grotte*) of St. Peter's at Rome. It is the sarcophagus of the prefect Junius Bassus (died 359 A.D.). Contemporary with this, though not so fine, are the carved porphyry sarcophagi of the mother and daughter of Constantine the Great in the Sala della Croce Greca of the Vatican. The sculpture of the arch of Constantine at Rome, such of it as was not simply transferred from a fine arch of Trajan dismantled for this purpose, is also Byzantine, and presents a curious and striking difference between the styles of earlier and later date, much to the damage of the latter. The design of the arch as a whole was taken from the finer Roman examples. (See PLATE.) Byzantine sculpture partakes of the narrow asceticism which ate into the heart of Christianity, and is permeated with a lifeless conservative rigidity of type and of form, a prudish avoidance of the nude, an attempt at gaining splendour by mere ornament instead of grace, and firmness of form by angularity of outline instead of simplicity of design—all of which are fatal to it as a high and noble style of art. At the same time the execution is generally very careful, and there is not wanting a dignity springing from pure motive. In small works, as ivory carving and metal casting and beaten work, with which the churches of the time were over-full, the style is often very successful. The altar of St. Ambrose in Milan, in reposso silver-gilt plates full of figures, is one of the finest examples of the ninth century of this kind. As has been mentioned, the very fine and pure style of Niccolo Pisano was the outcome of the study of Byzantine art, and through this channel came the glories of the Italian sculpture of the middle ages.

Painting and Mosaic. In the Byzantine school rose to great technical excellence, and are still pursued almost unaltered in the Greek Church of to-day. Onwards from the fourth century, but perhaps at their best in the sixth century, we find those splendid examples of mosaic, with their characteristic gold background, the work of which is so perfect that they look as if finished but yesterday. The forms are stiff and conventional, the draperies rigid and overloaded, but the execution is most neat and careful, and the colouring is not seldom magnificent. The great storehouse of Byzantine mosaics is St. Mark's at Venice, which is literally covered with the most splendid and interesting examples of the later period of the style. The mosaics of St. Maria in Trastevere (1139-53), and the mosaics and paintings of the Basilica San Clemente (eleventh and twelfth centuries) in Rome, show a new departure; and the conquest of Constantinople by the Latins in 1207 brought new workers from the East, who with such Italians as Quinca of Pisa, Guido of Siena, Margaritone of Arezzo (a work by whom is in the National Gallery), &c., still further deviated from Byzantine conventionality towards the study of nature, till Cimabue (1240-1312) arose from the result

of their labours to found the grand school of modern Italian painting. In him and his contemporaries Byzantine art receives a glorious transformation, and Torriti's mosaics at the Lateran and Santa Maria Maggiore, and Gaddi's painting of the "Ascension" at Pisa, are already, beyond the ancient limits. See PAINTING, HISTORY OF, for the further development of the art.

BYZANTINE EMPIRE. See GREEK EMPIRE.

BYZANTINE HISTORIANS is the name given to a series of Greek historians and writers who have lived under the Eastern or Byzantine Empire between the fourth and the fifteenth centuries; that is, from Constantine the Great to the fall of Constantinople before the Turks in 1453. They may be divided into two classes—1, The Historians, properly so called, whose collected works constitute a complete history of the Byzantine Empire from the time of Constantine the Great to the taking of Constantinople by the Turks; and 2, the General Chroniclers, who have attempted to give a chronography of the world from the oldest times.

The Historians are the following:—1, Joannes Zonaras of Constantinople, who wrote the "Annals of the World," in eighteen books, from the Creation to 1188. 2, Nicetas Acominatus of Chione or Colossæ in Phrygia. His "History of the Byzantine Emperors," in twenty-one books, begins with 1188 and ends with 1206. 3, Nicephorus Gregoras of Heraclea wrote a Byzantine History, in twenty-four books, from 1201 to 1331. The fourteen remaining in MS. bring the history down to 1359. 4, Laonicus (Nicolas) Chalcondylas of Athens wrote a "History of the Turks and of the Downfall of the Greek Empire," in ten books, from 1297 to 1462. An anonymous writer has continued the history of the Turks down to 1565. These four writers form an entire history of the Byzantine empire from the time of Constantine to the Turkish conquest.

In addition to these, numerous writers have treated of detached periods of the same history, or have written the lives of particular emperors. Of these some of the most important may be mentioned, and first, Zosimus, author of a valuable epitome of the early Roman Empire, and Procopius, AGATHUS of Myrina, in Æolis, was a poet as well as historian of the sixth century. Constantinus VI. Porphyrogenetus wrote the life of his grand father, the Emperor BASIL (the Macedonian), from 867 to 886, and several other works which serve as illustrations of Byzantine history. Nicephorus Bryennius, the husband of Anna Comnena, wrote "Historical Materials," being a kind of memoirs of the Comnenus family, to the accession of Alexis. Anna Comnena wrote the history of her father ALEXIS. Joannes Cimannus, who lived towards the end of the twelfth century, wrote the lives of John Comnens and of Manuel his son, from 1118, when Anna Comnena ends, till 1176. Georgius Acropolita filled several important offices under Michael Palæologus. He wrote a "Chronography" and a "Short Chronicle of the late Events," both referring to the period from 1204, when the Franks took Constantinople, to 1261, when they were finally expelled. Georgius Pachymeres wrote a Byzantine history, which forms a continuation to Acropolita's work, and comes down to 1308. The Emperor Joannes Cantacuzenus, after his abdication of the empire in 1355, wrote a Byzantine history from 1320 to 1357. Georgius Phantza, born in 1401, of a family related to the Palæologi, wrote a valuable "Chronicle," in four books, which begins with 1260 and ends with 1477, embracing the whole history of the Palæologi.

The following are the chief among the General Chroniclers, properly so called, who are also included under the appellation of Byzantine Historians:—Georgius Syncellus wrote a "Chronography" from the beginning of the world to the time of Diocletian, in which he has availed himself of Eusebius and Africanus. Theophanes Isaacus of Con-

stantinople continued the chronicle of Syncellus from 280 till 813. The "Chronicon Paschale," called also the Alexandrian Chronicle, extends from the beginning of the world to 1042. Nicephorus, patriarch of Constantinople, in the first part of the ninth century, has left a "Breviarium Chronographicum" or short chronicle from the creation to the author's death in 828. He wrote also a "Breviarium Historicum" or general history of events from 602 to 770. Georgius Cedrenus, a monk, wrote a chronicle compiled chiefly from the chronicles of Seylitzes and others. Simeon Metaphrastes wrote a chronicle which comes to 953. Michael Glykas wrote a chronicle from the creation to the year 1188.

Besides these there are other Byzantine authors who have written on various subjects. Among these Procopius stands foremost. Joannes Laurentius Lydus wrote on the calendar. Hierocles, called the Grammarian, wrote a Synecdemon or traveller's guide, in which he describes the sixty-four provinces of the Eastern Empire, and the 935 cities or towns contained in it. The Emperor Alexis Comnens wrote a "Novum Rationarium" or Inventory of the Revenues of the State. A monk of unknown name, who lived under Alexis I., wrote a book on the antiquities of Constantinople, which gives a description of its buildings, monuments, &c. It is inserted in Banduri's "Imperium." The Emperor Manuel Palæologus wrote a book "On the Education of Princes."

Most of the above Byzantine Historians, Chroniclers, and other writers were collected and published in the great edition made by order and at the expense of Louis XIV., in thirty-six vols. folio (Paris, 1645-1711). The Greek text is accompanied with a Latin translation and notes.

Another edition was published at Venice in twenty-three vols. folio (1729, &c.), which contains several works omitted in the Paris edition. Other volumes were published separately afterwards as a supplement to the Venice edition. Several of the Byzantine Historians still remain inedited.

A new edition of the Byzantine Historians was projected by Niebuhr, "Corpus Scriptorum Historiæ Byzantinæ" (Bonn, 1828, and following years). It was begun after Niebuhr's death, under the care of Bekker, Dindorf, Lachmann, and other philologists; the issue still continues.

BYZANTIUM, an ancient Greek city, which occupied part of the site of modern Constantinople. According to Eusebius and other ancient authorities, Byzantium was founded by a colony from Megara, 658 B.C., seventeen years after the building of Chalcedon, on the opposite or Asiatic shore of the Bosphorus, by another colony from Megara. The harbour of Byzantium became a place of resort, owing to the absence of tides and the depth of its waters, for vessels trading with the Euxine, the northern coasts of which already, in the time of Herodotus, supplied with corn, as they do now, Greece and other countries of the Mediterranean; while the wealth derived from the fisheries at the mouth of the Lycus gained for the curving bay the appellation of "The Golden Horn."

In the reign of Darius Hystaspes the town was taken and destroyed by the Persian satrap Otanes, but after the battle of Plataea, B.C. 479, Pausanias, at the head of the united Greek forces, took it, and a fresh colony of mixed Athenians and Lacedæmonians was sent to it; and this mixture of populations for a long time was the cause of numerous misfortunes to the town from their mutual rivalries. The Lacedæmonians kept possession of Byzantium till Pericles took it from them, but they retook it shortly afterwards. Alcibiades again got possession of it by a stratagem. Lysander recovered it soon after, and it was under the Lacedæmonians when Xenophon, with the remnant of the 10,000, passed through it on his way home; and so exasperated were the brave Greeks with the conduct of the governor that Byzantium was only saved from pillage by the greatest exertions of their general. Thersibulus drove the Lacedæmonians away, 390 B.C., and changed the form

of government, which was before aristocratical, or rather oligarchical, into a democracy. After the recovery of its liberty Byzantium became the head of a sort of confederacy of the neighbouring maritime towns. Philip of Macedon, having extended his conquests into Thrace, laid siege to it. On a dark night his soldiers were near surprising the town, when a "light shone suddenly from the north," and revealed to the inhabitants their danger. In gratitude for this the Byzantines built an altar to Heate, and assumed the crescent as the emblem of their city. This sign is on several medals of Byzantium, and the Turks, on their conquest of Constantinople, adopted it for their own device. Under Alexander the Great and Lysimachus, who at Alexander's death succeeded to the government of Thrace, Byzantium submitted to the Macedonians; but it afterwards recovered its independence, which it retained till the time of the Roman emperors. Its maritime commerce was prosperous; but it was exposed on the land side to continual incursions of Thracians, Scythians, and other barbarians, who ravaged its territory and cut down the harvest. The most troublesome of these incursions was that of the Gauls, who overran Macedonia and Northern Greece about 270 B.C. The Byzantines, in order to have some respite from them, were obliged to pay heavy sums. These and other burdens compelled them to have recourse to extraordinary measures for raising money, one of which was the exacting of a toll from all ships passing through the Bosphorus, which became the cause of the war between Byzantium and Rhodes about 221 B.C. The terms at last went over to Asia, and left Byzantium in peace.

Byzantium joined the Romans against Philip II. of Macedonia, as well as against Antiochus and Mithridates. In

consequence of its services it retained its liberty as a free town confederate with Rome. The Byzantines were subject to a tribute, at least under the first emperors, which Claudius remitted for five years, in consideration of their losses during the Thracian War. (Tacitus, "Ann." xii. 62.) In consequence of some domestic broils, Vespasian took away their liberties and sent them a governor. In the civil war between Severus and Pescennius Niger, the Byzantines took the part of Niger, after whose death Severus besieged the town, which the inhabitants defended for three years. Famine obliged them to surrender, and Severus treated them with his characteristic inhumanity. Afterwards, on visiting the fallen city, he repented of his former cruelty, and took pains to embellish the town; he built magnificent baths, porticoes round the hippodrome and other buildings, and gave it the name of Augusta Antonina, in honour of his son Antoninus. The Byzantines, having rebuilt their walls and recovered their prosperity, had next the misfortune of displeasing Gallienus, who entered the town under a promise of amnesty, and massacred most of the inhabitants. The town, however, was restored, and it repelled an irruption of the Goths, who had entered the Bosphorus under Claudius II. After the defeat of Lucinius by Constantine, Byzantium surrendered to the latter, who was so struck with its situation that he determined to build a new city by the side of old Byzantium, and which he chose afterwards for the capital of the empire. In May, A.D. 330, the new town, which had been commenced only three years before, was dedicated to the Virgin Mary, and the feasts in honour of the occasion lasted forty days. The Byzantines were not noted for bravery, but they had a great reputation for profligacy and luxury. See CONSTANTINOPLE.

C

C. This letter is derived from the Latin alphabet, in which it first appears. But even at that alphabet it already possess the power of *g*, as pronounced in *quagga*. The Roman names *Calvus* and *Cicero*, which are in this manner correctly represented in the Greek *kallos* by *kallos* and *kikero*; and the Dutch inscription of the orthography of which, however, seems to belong to a later date than the events celebrated in it, presents *conventen*, *confinen*, &c. in the place of the modern *conventen*, *confinen*, &c. This silent palatal pronunciation corresponds with the power of the letters which occupy the third place in the Greek and Hebrew alphabets, *qaph* and *gimel*; and the utility of the letters is confirmed by the similarity of the names.

1. Before *e* in Latin *c* becomes the sord lingual sibilant; that is, pronounced as *ch* before *e* and *i*. But before *a*, *o*, *u*, &c. it becomes the sord palatal mute; that is, it sounds as *ch*. Therefore it is manifest that *c* is redundant, and that the difference in sense and between "*capere*" and "*capere*" is between "*Kind*" and "*kind*," and either *c* or *ch* is superfluous in every place for *c*, so far as sound goes. In fact the *c* is a new arbitrarily spell "*pretence*," and serves only to mark any alteration of sound or sense. (Hence, by the way, the notation is to indicate a Latin etymology.) For the *c* and *ch* happily gave both sounds of *c*.

The letters *c* and *ch* are to the following interchanges:—
1. In the name *c* of French words from the Latin, *c* before *a* is changed to *ch* before *ch*; for example, the Latin *canem*, a word which before *c* and *ch* appear in French under the form *chambre*, *chambre*. In this way the English language has derived *channel*, *chettle*, &c., through the French, from the Latin *canem*, *capitulum*, and at the same time possesses the words *canal* and *cattle*, derived from the same roots, but by a different route.

2. The change of *c* into *ch* prepares us for that of *c* into *z*, as Lat. *facimus*, we do, Fr. *façons*; Lat. *placere*, *licere*, Fr. *plaisir*, *loisir*, Eng. *pleasure*, *leisure*. Herodotus has observed (ix. 20), that the commander of the Persian cavalry, Makiastos, was called by the Greeks Makistios; and the same interchange may occasionally be seen in the Teutonic languages, as in the German *faust* and *fichten*, English *fast* and *fight*, words as certainly related as the Latin *poquere* and *pugare*.

3. *C* initial of the language corresponds to *h* in the German. Compare *collum*, *hals*, neck; *clia*, *haut*, hide; *canabis*, *hanf*, hemp; *cornu*, *horn*, horn. Traces of the same change are visible within the Latin itself, as *traho*, *trahi* (*trac-si*); *ceho*, *eri* (*cec-si*). *C* was also often interchanged with the Saxon aspirated *h*. In the north of England the old words *licht*, *nicht* (now light, night) sound as *licht*, *nicht*, preserving this otherwise lost sound of *h*. We find *c* standing for this *h* frequently, as Bereta, Cudbert. So also *sist thou* in "Piers Plowman," for "seest (seest) thou."

4. *C* is convertible with *c* and *o*. This may be seen in the related forms *Darus*, *Darus*; *fecus*, *forco*; *nir*, *niria*; *conuicere*, *conuicere*; *lucus*, *laro*; *vico*, *vici*; *struo*, *strukt*. Thus, too, the English *quick* (the original meaning of which is seen in the phrase "the quick and the dead") is identical with the Latin *civis*.

5. *C* into *g*. The change already mentioned of the power of the Roman symbol *C* is a sufficient proof of this. We may add *cupre*, *magre*, derived through the French *cuire*, *maigre*, from the Latin *acer*, *macer*. The same change appears in the Teutonic languages. To the Latin *oculus* corresponds the German *auge*; to *duc-o*, *zog* and *zug*; while the Latin *lac-ruma*, or Greek *dak-r-uon*, has in Gothic the form *tagr*, a tear.

6. The interchange of *c* with *p* is most remarkable in the Greek and Latin languages, the former commonly preferring the labial. Gr. *pepto*, Lat. *coquo*, cook; Gr. *cipo*, Lat. *linguo*, leave; Gr. *pipto* (or rather *pipeto*), Lat. *cado*, fall, &c. The same interchange appears within Italy itself; the pigeon in Rome was called *columba*; the pigeon out of Rome, that is, the wild pigeon, was called *palumba*; so *proximus*, nearest, has supplanted *prosimus*, from *prope*, near. The Latin word *quicquid* was pronounced by an Oscan as *pūpit*. This convertibility of the *tenues* extends to the letter *t*. Thus we find *scapula* and *spatula*, both conveying the notion of a *blade*. The Greek *tetartos*, fourth; *tis*, who; *te*, and, appear in Latin as *quartus*, *quis*, *que*.

7. Latin words beginning with *ca* have often lost the guttural. Thus *ubi* occupies the place of *cubi*, an old dative of the relative (compare *sicubi*, *alicubi*, &c.) This variety appears in our own tongue, where *which*, formerly *whilk*, was once written *quhilk*, &c.

8. *C* often disappears, as far as sound is concerned, before *l* and *n*, owing to the difficulty of pronunciation, as in *knee*, Lat. *genu*; *know*, Lat. *gnos-co*. From the old Frank name *Clodwig*, *Cloris*, are derived *Louis*, *Ludovicus*, *Ludwig*, *Lorick*.

9. In the derivation of Italian and French words from the Latin, *c* disappears before a *t*, the preceding vowel being commonly strengthened, as Lat. *ctatus*, said, It. *ditto*, Fr. *dît*; Lat. *coctus*, cooked, It. *cotto*, Fr. *cuit* (whence *bis-cuit*, twice baked). It also disappears at times before an *r*, as in Lat. *sacramentum*, oath, Fr. *serment*; Lat. *lacrima*, a tear, Fr. *larme*. The same thing occurs when it is flanked on each side by vowels; compare the Latin *locus*, *juvus*, *focus*, *oculus*, *uocare*, &c., with the French *lieu*, *jeu*, *feu*, *œil*, *voire*, &c.

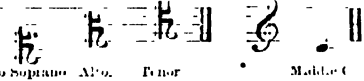
C, in music, may be considered as now the most important note in music, since it is the key-note of the only scale which can be written in the ordinary notation without the use of ACCIDENTALS, and the only one which can be played on the pianoforte without the use of the black notes; hence the scale of **C** is frequently called the *natural scale*. For this reason the music of horns and trumpets for the orchestra is written in this key, whatever be the key of the composition; but the performer, though he plays in the key of **C**, yet by means of the "crooks," which may be added to lengthen or shorten the tube of the instrument, produces the corresponding sounds of the key desired. In fact, he plays as one would do on a transposing pianoforte, the keys of which can be shifted to right or left, so that while the fingers continue to play in the key of **C**, the instrument sounds the key of **B \flat** , of **G**, or of any other note.

The note we call **C** was the key-note of the Hypo-Eolian mode or scale of the ancient Greeks, and of the Ionian mode of the mediæval system. [See MODUS ECCLESIASTICAL and GREEK MUSICAL SYSTEM.] It was distinctly avoided in the middle ages as a key-note—a fact hardly credible to us, whose whole musical system rests on the major scale; for the cultivated musicians of the middle ages were unable to get a major scale from any note but **C** until nearly 1500, when flats and sharps came into use. Up till then they were as a man who uses only the white notes of a pianoforte. "Ein feste Burg" is almost the earliest melody of importance still extant written in the Ionian mode (key of **C**). But with the popular musicians, the players at dances and fairs, the case was altogether different; and the important writer Zarlino (1519-90) says of the Ionian mode—"It is spoken of as well adapted for dances, since the greater number of those we hear now in Italy are set in this mode, whence it has arisen that in our days some call it *il modo lascivo*." (He mentions, however, compositions of Palestina and Josquin des Prés in this mode as known to him.) The popular ear, not misled by theoretical scruples, had found out the brightness

and gaiety of the major scale, and danced to it without caring to know why it was the most pleasing. In this way the theorists were gradually vanquished, and the once despised Ionian mode became the foundation of modern music. See SCALE.

The **C** clef is only a modification of the actual letter **C**. [See CLEF.] Its office is to indicate the line bearing the note called "middle **C**" (*c'*), and it is used in three staves, the *mezzo-soprano* (Mendelssohn's chorus-stave), where it is on the lowest line; the *alto*, where "middle **C**" is the middle line of the staff; and the *tenor* stave, where it is the second line from the top. These three staves are often called **C** staves.

C Staves



The sign for "common time" ($\frac{1}{4}$ time) is now made simply as the letter **C**, but it has no relation to this letter; and it would be manifestly absurd to suppose, as some have done, that it stands for the initial letter of the English word *common*, since that word in other languages begins with other letters, whereas the sign is universal. It is really the half of the circle denoting perfect (triple) time, and thus served to indicate imperfect (duple) time. [See TIME.] **C** with a dash through it is for $\frac{3}{4}$ or ALLA BRIVE time.

In German **C** bears the same name as in English, **C** being called *Cis*. In French **C** is called *Ut*, and **C \sharp** *Ut dièse* (Ital. *Ut diesis*). Sometimes in French and Italian *di* is used, as in *ingénue* melodious, instead of *ut*—a name *di* is also preferred by the tonic sol-fa writers, and with reason, as far as usefulness goes, though the change cuts at the root of an interesting musical tradition. See GIMNO D'AMAZZO.

CA'ABA or **KAABA** (more strictly **KABA**, and sometimes **Kaabe**) is the name of the sacred building contained within the great mosque of Mecca, and itself holding the mysterious Black Stone, object of worship to the Arabs from time immemorial. Diodorus Siculus mentions the Black Stone and the **Caba** itself as the temple most honoured in his time (50 B.C.). De Saey, who examined it, says it is an acrolite; therefore, says Carlyle finely, "some man might see it fall out of Heaven;" which would account for its sanctity. The Arabs have a legend that it was Adam's heaven-sent altar of worship, and that a building was erected over it by Abraham. The stone was white until the sins of mankind turned it black. The well Zamzem, which is within the **Caba** beside the Black Stone, is by the Arabs regarded as the well which Hagar found in the wilderness. What is most certain is that the **Caba** and its sacred contents formed the rallying point of the Arabs for a thousand years before Mohammed. The **Caba** was rebuilt in 1627, and now stands about 36 feet every way, in a double row of pillars hanging thick with lamps and ornaments, covered with the sacred "carpet" (which is really of embroidered silk) sent yearly from Cairo by the Sultan. The **Caba** was decreed by Mohammed to be the *kibla* or centre of Islam; all Mohammedans must turn towards it when praying. The keepers of the **Caba** were naturally in early times very important persons amongst the Arabs. The Kinanah tribe held the post in the times of Mohammed, and the prophet himself was of this tribe. This no doubt added to the horror with which his denunciation of idolatrous worship like that of the Black Stone itself was at first received. Every Mohammedan is bound under his or her life, if it is humanly possible, to visit the **Caba** and perform the holy ceremonies as a *hadji* or *pilgrim*. The curious rite is described in a special article, HADJI.

CACING WHALE (*Globicephalus melas*) belongs to the DOLPHIN family of the order CÆCATA. These whales, also known as Pilot Whales and Black Whales, frequent the northern seas in great herds. Mr. Bell

states that an entire shoal of 780 individuals was once captured in the Shetlands; and between the years 1809 and 1810 another shoal came on shore at Hvalford in Iceland, consisting of no less than 1110 examples, all of which were taken. Their appearance off the coasts of Orkney, Shetland, and the Faroe Isles, is by no means infrequent, and they prove a source of wealth to the inhabitants. "On the appearance of a shoal," says Mr. Bell, "the sailors endeavour to get to seaward of their victims, and gradually closing upon them, drive them onwards like a flock of sheep, and urge them by shouts and missiles towards the shore; when one of them, some say a leader, being forced on the beach, a curious scene of self-immolation is acted by the whole herd. They are then attacked by the entire population, who despatch them by various means; and the cries and dying struggles of the poor animals, some in and some out of the water, the shouts and exertions of the men, and the troubled and bloody sea, combine to form a scene of no trifling interest and excitement." The food of the eating whales consists mainly of cuttle fish, though cod and other large fishes are also eaten. The eating whale sometimes attains a length of 25 feet. As the generic name implies, the head is convex and rounded; the species is further distinguished by its long pectoral flippers and black skin, the belly and throat being white along the central line. The jaws are furnished with ninety-six teeth. The name eating, applied to these whales by the Shetlanders, signifies "driving."

CABAL is often applied to a set of persons, too insignificant in point of number to form a party, who endeavour to effect their purposes by underhand means. The ministers of Charles II., Clifford, Ashley, Buckingham, Arlington, and Lauderdale, the initials of whose names happen to form the word cabal, were called the "Cabal Ministry." The word "cabal" appears to come from the French *cabale*, a term employed to express a number of persons acting in concert; and it is generally understood in a bad sense (Richalet, "Dictionnaire"). The remote origin of the word is probably the Rabbinical *Kabbalah*. We are not aware that it was used in our language before the time of Dryden.

CABANIS, PIERRE JEAN GEORGES, a distinguished French physician and philosopher, was born at Cosne in 1757. At the age of fourteen he was sent to Paris, where for two years he devoted himself to an earnest study of literature. Dissatisfied with his prospects in this career, he applied himself for six years to the study of medicine with so much intensity that his health began to fail him, and he went to reside at Autun, where he became acquainted with the widow of Helvétius. At the house of this lady, who in a manner adopted him as her son, he became intimate with the most celebrated men of that age, Lavoisier, D'Holbach, Condillac, Diderot, D'Alembert, Benjamin Franklin, Marbeu, and Condorcet. He died somewhat suddenly, 5th May, 1808, in the fifty-second year of his age. He had borne a part in the events of the Revolution, was one of the Council of Five Hundred, and afterwards a member of the Senate. He was the author of several works, but that by which he has been chiefly distinguished is his "Rapports du Physique et du Moral de l'Homme," which displays no ordinary power of observation and analysis. It is remarkable, too, as being the first attempt to treat in a systematic form, the interesting but difficult subject which it investigates. He has been accused by Carlyle ("M. C.") and others of saying, "The brain sciences thought as the liver secretes bile," which in truth is only a brilliant epigrammatic caricature of his system, and has brought a very valuable contribution to a highly obscure subject into unmerited contempt. Cabanis said, "To understand the operations resulting in thought, the brain must be considered as an organ specially appropriated to the production of thought; in the same manner the

stomach and the intestines are specially appropriated to digestion, the liver to the formation of bile" ("Rapports," ii.) Careless or malicious readers have twisted this harmless sentence into making thought a secretion.

CAB BAGE. This vegetable, with its varieties, is generally admitted to be derived by cultivation from the wild cabbage (*Brassica oleracea*), which grows on cliffs on the southern shores of the British Isles, in Heligoland, Laland, the Channel Isles and opposite French coast, as well as near Nice. A. de Candolle (in "L'Origine des Plantes Cultivées," 1883) says that the species is indigenous to Europe, that its cultivation is very ancient, probably dating from before the invasions of the Aryans, and that the wild plant was used before cultivation began. The flowers of the wild cabbage are large and cream-coloured, the leaves thick and fleshy, and the upper ones oblong without stalks.

Cabbage plants are generally raised first in a seed-bed. When they are intended for early produce, they are sown before winter, and protected by shelter, or under glass frames. In this manner strong plants may be had early in spring, which, planted out in April, will produce fine cabbages by July or August. The cultivation of cabbages is the same in the field as in the garden, except that on a large scale less attention is paid to each plant, and the spade is superseded by the plough and other field instruments. A good and rather stiff loam is best adapted for cabbages. They require a considerable portion of manure, if the land is not naturally rich, or if they are cultivated as a part of a regular rotation. There is no vegetable which produces so large a portion of food for cattle on the same space as the cabbage, provided the soil suits its growth. The great advantage in the cultivation of the cabbage is, that a great portion of its substance is restored to the ground, in all well-regulated farming establishments, in the shape of the dung and urine of the cattle fed upon them. It is asserted by experienced agriculturists, that in this respect it is superior to the common turnip. When given to cattle or sheep, cabbages should be sliced in the same manner as turnips or beet-root. When milch cows are fed with them, all the decayed leaves should be carefully taken off and given to store cattle or pigs, for these are the chief cause of the bad taste which the milk and butter acquire from this food. For bullocks, cabbages and oil cake are excellent food, and increase their flesh rapidly. For sheep, they should be sliced, and given to them in troughs in the field where the cabbages grow, or on grass land which requires to be manured.

In Germany there is an immense consumption of the large white cabbage in the form of the national mess, called *sauerkraut*. It is prepared by slicing the cabbages, and placing them in a tub with alternate layers of salt and allowing them to ferment. This preparation, when washed with soft water and stewed with bacon or salted meat, is a very wholesome dish, and much relished by those who have been early accustomed to it. In long voyages it has been found to be an admirable preservative from scurvy.

It may be stated generally that there are 420 grains of carbon and 14 grains of nitrogen in a pound of cabbages. Therefore on such substances alone life could not be preserved, since more would require to be digested than the stomach could possibly manage, in order to yield the necessary quantity of nitrogenous matters. But this is not to say that they are not exceedingly healthy and palatable foods taken in due quantity, very thoroughly cooked. The last is an important point, as they are not easily digestible, and take from three to four hours to pass through the stomach.

The chief constituents of cabbage are thus given by Professor A. H. Church:—In every 100 parts there are 89 of water, 1.5 of albumen, 5.8 of sugar, starch, and gum, 0.5 of fat, 2 of cellulose and lignose, and 1.2 of

mineral matter. "One pound of cabbage contains flesh-formers equal to nearly a quarter of an ounce of the dry nitrogenous substance of muscle or flesh." Cabbage and similar green succulent vegetables, Brussels sprouts, broccoli, turnip tops, spinach, &c., are the least nutritious class of vegetable foods, and are valuable rather for the medicinal saline juices than for the direct nourishment they afford. Anderson gives the following analysis of the common cabbage:—

	Young Plant.	Outer Leaves.	Heart.
Water,	91.8	91.1	91.1
Nitrogenous matters,	2.1	1.6	0.9
Woody fibre, gum, and sugar, . .	4.5	5.1	4.1
Ash or salts,	1.6	2.2	0.6

CABBAGE-BARK TREE is the West Indian name for *Andira inermis*, a round-headed tree with panicles of showy violet flowers, belonging to the order LEGUMINOSÆ. A decoction of the bark is anthelmintic, but care must be taken in administering a dose, as it is also a powerful narcotic. There are seventeen species of *Andira*, all beautiful trees, natives of tropical America, one species being also found in tropical Africa. The calyx has short teeth or none; the wings are free; the fruit plum-like, with one pendulous seed.

CABBAGE-PALM. See ARIACA.

CABBALA. See KABBALAH.

CABET, ETIENNE, a celebrated French communist, was born at Dijon, 2nd January, 1788. His father, who was a cooper, gave him a liberal education, and he adopted the profession of law, and practised at first at the bar of his native town. He afterwards went to Paris, where he turned his attention to literature and politics, becoming one of the leaders of the Carbonari, and starting a Radical paper, *Le Populaire*. For an article in this paper he was prosecuted by order of the Chambers, and sentenced to imprisonment for two years and to pay a heavy fine. He escaped to London, where he continued his socialistic studies, and gradually adopted the principles of pure communism. On his return to Paris after the amnesty he published a "History of the French Revolution" (1840), and a socialistic romance, entitled "Voyage en Icarie," (1840, 5th edition, 1842). This work had immense popularity among the workmen of Paris, and when in 1847 he published in his paper the laws for the formation of an "Icarian colony" in Texas, there were many who volunteered to emigrate. The first division started in February, 1848, but its experiences were anything but satisfactory. Nevertheless he embarked at the head of a second band of followers, who established themselves in the deserted Mormon settlement at Nauvoo, in Illinois, in 1850. Here Cabet ruled as president until 1856, when he was deprived of his office and compelled to flee to St. Louis, where he died on the 9th December of the same year. A shallow thinker, and destitute alike of eloquence and ability to govern, he attained his success, such as it was, by his determined persistence.

Looking at his career in the light of later events, he certainly seems deserving of commendation for the harmless manner in which he endeavoured to realize his ideas. To plant a colony which should be ruled by the principles of communism on one of the unoccupied portions of the globe, is certainly a better method than the efforts made to spread these principles by means of petroleum and dynamite.

CABIN, the nautical term for a room or apartment on shipboard. In the large ships of war the admirals' and captains' cabins extend across the ship near the stern, are elegantly fitted up, and are usually divided into two, termed the fore-cabin and after-cabin. The cabins of the chief officers are placed on either side of the main deck, and the sides of the lower or orlop deck are utilized for the cabins

of the junior commissioned and warrant officers. The partitions by which all these cabins are inclosed are made of light panelling, and are instantly removable when the ship prepares for action. In some of the more modern ironclads apartments have been built above the armoured deck for the use of officers, &c., which are not removable, but would be deserted during action, and left to take their chance of the fire of the enemy. The word comes from the Celtic (Welsh and Irish also) *caban*, a hut.

CABINET. According to the constitution of England the king is irresponsible, or, as the phrase is, he "can do no wrong." The real responsibility rests with his ministers, who constitute the Cabinet. In their collective capacity they are called also the Administration, the Ministry, his Majesty's Ministers, or the Government. The king may dismiss his ministers when he pleases. But this is a step not to be lightly hazarded, for if a ministry is supported by a majority of the House of Commons the change would be useless, as the measures of a new ministry, of different principles, could not be carried in opposition to the opinions of a majority of the Commons. A ministry may therefore retain their posts in spite of the well known dislike of the king. He may dissolve Parliament and appeal to the country, and in this way he may gain his object; but he may also be foiled in the attempt. If the ministers resign from inability to carry their measures, or are dismissed, the king sends for some leader of the party opposed to the late ministers, and authorizes him to form a new cabinet. The individual who thus receives the king's commands selects from those who are friendly to his policy the members of his cabinet, and usually takes the post of Prime Minister. The Prime Minister is generally First Lord of the Treasury. The ministry is spoken of frequently as the ministry of the person who is at its head. The other principal members of the Cabinet are—the Lord Chancellor, the three Secretaries of State for Home, Colonial, and Foreign Affairs, the Lord Privy Seal, and the Chancellor of the Exchequer. It should contain members of both Houses of Parliament. Other heads of public departments may also be called upon to take a seat in the Cabinet, as the First Lord of the Admiralty, the Postmaster-general, the President of the Board of Trade, the President of the Local Government Board, the Secretary at War, the Secretary for India, and the Chancellor of the Duchy of Lancaster. On some rare occasions a member of the government has combined in himself two offices, each of which invariably confer a seat in the Cabinet; Mr. Gladstone, for instance, in 1873, and again in 1880-83, filled at once the two offices of Prime Minister and Chancellor of the Exchequer. Lord Mansfield was a cabinet minister at the time he was Lord Chief-Justice of England, but this is an exception.

The Privy Council was formerly the adviser of the king in all weighty matters of state. Affairs were debated and determined by vote in his presence, subject, however, to his pleasure. In the reign of William III., Mr. Hallam states, "the distinction of the Cabinet from the Privy Council, and the exclusion of the latter from all business of the state, became fully established." The Privy Council is, even now, occasionally assembled to deliberate on public affairs, but only those councillors attend who are summoned. Proclamations and orders still issue from the Privy Council.

In France the executive government is divided into nine departments, the heads of which constitute the Cabinet. These are—the interior, justice and public worship, public instruction, public works, commerce and agriculture, finances, foreign affairs, war, marine, and colonies.

In the United States of North America the following officers of the executive government form the Cabinet, and hold their offices at the will of the President: Secretary of State, Secretary of the Treasury, Secretary of War, Secretary of the Navy, the Postmaster-general.

CAB'IRI (*Kabeiroi*), ancient Pelasgian divinities, belonging to a system of religion which, in the later ages of Greece, was connected with the celebration of mysterious rites in the island of Samothrace.

CABLE. This name was originally given to the rope, made of hemp or other fibre, which was used for attaching to the anchor of a ship, and when made by the "twisting" or "laying up" of smaller ropes exceeded 9 inches in circumference. Cables were made in lengths of 120 fathoms each for general use, and this in the course of time became a measure for short distances at sea. The cables used by the ill-fated *Royal George* were 27 inches in circumference.

Many experiments were made by Räumur, Knowles, and others, to test the loss of strength by the ordinary twist given to ropes. Duhamel prepared the following statement to show the comparative strength of ropes formed of the same hemp and the same weight per fathom, but twisted respectively to two-thirds, three-fourths, and four-fifths of the length of their component yarns:—

Degree of Twist.	Weight borne in Two Experiments.	
$\frac{2}{3}$	1098 lbs.	1250 lbs.
$\frac{3}{4}$	1850 "	6753 "
$\frac{4}{5}$	6205 "	7397 "

In shroud or hawser-laid ropes the usual reduction of length by twisting is one-third; but cable-laid ropes are further shortened, so that 200 fathoms of yarn are required to make 120 fathoms of cable.

The following simple rule for calculating the strength of ropes is given by Robinson:—Multiply the circumference of the rope in inches by itself, and the fifth part of the product will express the number of tons the rope will carry. For example, if the rope be 6 inches in circumference, $6 \times 6 = 36$, the fifth of which is $7\frac{1}{5}$, the number of tons which such a rope will sustain. To find the weight of shroud or hawser-laid rope, multiply the circumference in inches by itself, then multiply the product by the length of the rope in fathoms, and divide by 420; the product will be the weight in cwt. Example—to find the weight of a 6-inch hawser laid rope, 120 fathoms long, $6 \times 6 = 36 \times 120 = 4320$, which divided by 420 gives the weight of the rope, 10 cwt. 1 qr. 1 lbs. To find the weight of cable-laid cordage, multiply its circumference in inches by itself, and divide by 4. The product will be the weight, in cwt., of a cable 120 fathoms long, from which the weight of any other length may be readily reduced. Example—required the weight of a 12-inch cable, 120 fathoms long, $12 \times 12 = 144$, divide by 4, and the product, 36, is the weight in cwt.

* CHAINS AND ANCHORS FOR STEAM VESSELS.

CHAINS AND ANCHORS FOR SAILING VESSELS.

Stud-chain Cables (c) (a).					Stud-chain Cables (c) (b).				
Minimum Size.	Proved to Admiralty Test.	Breaking Test.	Length.	Ship's Tonnage	Minimum Size.	Proved to Admiralty Test.	Breaking Test.	Length.	Ship's Tonnage.
Inch.	Tons.	Tons.	Fathoms.	Tons.	Inch.	Tons.	Tons.	Fathoms.	Tons.
$\frac{1}{16}$	8 $\frac{1}{2}$	12 $\frac{1}{2}$	120	75	$\frac{1}{16}$	8 $\frac{1}{2}$	12 $\frac{1}{2}$	120	50
$\frac{1}{8}$	10 $\frac{1}{2}$	15 $\frac{1}{2}$	120	112	$\frac{1}{8}$	10 $\frac{1}{2}$	15 $\frac{1}{2}$	120	75
$\frac{1}{4}$	11 $\frac{1}{2}$	17 $\frac{1}{2}$	135	150	$\frac{1}{4}$	11 $\frac{1}{2}$	17 $\frac{1}{2}$	135	100
$\frac{3}{8}$	13 $\frac{1}{2}$	20 $\frac{1}{2}$	165	188	$\frac{3}{8}$	13 $\frac{1}{2}$	20 $\frac{1}{2}$	165	125
$\frac{1}{2}$	15 $\frac{1}{2}$	23 $\frac{1}{2}$	165	225	$\frac{1}{2}$	15 $\frac{1}{2}$	23 $\frac{1}{2}$	165	150
$\frac{5}{8}$	18	27	165	262	$\frac{5}{8}$	18	27	165	175
$\frac{3}{4}$	20 $\frac{1}{2}$	30 $\frac{1}{2}$	165	300	$\frac{3}{4}$	20 $\frac{1}{2}$	30 $\frac{1}{2}$	165	200
$\frac{7}{8}$	22 $\frac{1}{2}$	34 $\frac{1}{2}$	195	375	$\frac{7}{8}$	22 $\frac{1}{2}$	34 $\frac{1}{2}$	195	250
1	25 $\frac{1}{2}$	38	195	450	1	25 $\frac{1}{2}$	38	195	300
$1\frac{1}{8}$	28 $\frac{1}{2}$	42 $\frac{1}{2}$	210	525	$1\frac{1}{8}$	28 $\frac{1}{2}$	42 $\frac{1}{2}$	210	350
$1\frac{1}{4}$	31	46 $\frac{1}{2}$	210	600	$1\frac{1}{4}$	31	46 $\frac{1}{2}$	210	400
$1\frac{1}{2}$	34	51	210	675	$1\frac{1}{2}$	34	51	210	450
$1\frac{3}{4}$	37 $\frac{1}{2}$	55 $\frac{1}{2}$	240	750	$1\frac{3}{4}$	37 $\frac{1}{2}$	55 $\frac{1}{2}$	240	500
$1\frac{7}{8}$	40 $\frac{1}{2}$	58 $\frac{1}{2}$	240	900	$1\frac{7}{8}$	40 $\frac{1}{2}$	58 $\frac{1}{2}$	240	600
2	43 $\frac{1}{2}$	61 $\frac{1}{2}$	270	1050	2	43 $\frac{1}{2}$	61 $\frac{1}{2}$	270	700
$2\frac{1}{8}$	47 $\frac{1}{2}$	66 $\frac{1}{2}$	270	1200	$2\frac{1}{8}$	47 $\frac{1}{2}$	66 $\frac{1}{2}$	270	800
$2\frac{1}{4}$	51 $\frac{1}{2}$	71 $\frac{1}{2}$	270	1350	$2\frac{1}{4}$	51 $\frac{1}{2}$	71 $\frac{1}{2}$	270	900
$2\frac{3}{8}$	55 $\frac{1}{2}$	77 $\frac{1}{2}$	270	1500	$2\frac{3}{8}$	55 $\frac{1}{2}$	77 $\frac{1}{2}$	270	1000
$2\frac{1}{2}$	59 $\frac{1}{2}$	82 $\frac{1}{2}$	270	1800	$2\frac{1}{2}$	59 $\frac{1}{2}$	82 $\frac{1}{2}$	270	1200
$2\frac{5}{8}$	63 $\frac{1}{2}$	88 $\frac{1}{2}$	270	2100	$2\frac{5}{8}$	63 $\frac{1}{2}$	88 $\frac{1}{2}$	270	1100
$2\frac{3}{4}$	67 $\frac{1}{2}$	94 $\frac{1}{2}$	300	2400	$2\frac{3}{4}$	67 $\frac{1}{2}$	94 $\frac{1}{2}$	270	1600
3	72	100 $\frac{1}{2}$	300	2700	3	72	100 $\frac{1}{2}$	270	1800
$3\frac{1}{8}$	76 $\frac{1}{2}$	107 $\frac{1}{2}$	300	3000	$3\frac{1}{8}$	76 $\frac{1}{2}$	107 $\frac{1}{2}$	270	2000
$3\frac{1}{4}$	81 $\frac{1}{2}$	113 $\frac{1}{2}$	300	3500	$3\frac{1}{4}$	81 $\frac{1}{2}$	120 $\frac{1}{2}$	300	2500
$3\frac{3}{8}$	86 $\frac{1}{2}$	120 $\frac{1}{2}$	300	4000	$3\frac{3}{8}$	86 $\frac{1}{2}$	134 $\frac{1}{2}$	300	3000
$3\frac{1}{2}$	91 $\frac{1}{2}$	127 $\frac{1}{2}$	300	4500					
$3\frac{5}{8}$	96 $\frac{1}{2}$	134 $\frac{1}{2}$	300	5000					
$3\frac{3}{4}$	101 $\frac{1}{2}$	142 $\frac{1}{2}$	330	5500					
$3\frac{7}{8}$	107	149 $\frac{1}{2}$	330	6000					
4	112 $\frac{1}{2}$	157 $\frac{1}{2}$	330	6500 to 7000					

(c) The chain cables and stream chains are to be tested in all cases according to the requirements of the Act of Parliament, and the certificates of test produced.

(d) Unstudded close-link chains will be admitted as cables if proved to *two-thirds* the test required for stud-link chains for the *tensile* strain, and 100 per cent. above the *tensile* strain for the *breaking* strain.

STEEL WIRE HAWSERS AND CABLES COMPARED WITH HEMP AND CHAIN.

Patent Flexible Steel Wire Hawser and Cables.				Chain Cable.				Tarred Hemp Rope.		
Size, Circumference.	Weight per Fathom.	Guaranteed Breaking Strain.	Diameter of Barrel or Sheave round which it may be worked.	Size.	Weight per Fathom.	Proof Strain.	Breaking Strain.	Size.	Weight per Fathom.	Breaking Strain.
inches.	lbs.	tons.	inches.	inches.	lbs.	tons.	tons.	inches.	lbs.	tons.
12	115	320	72	...	...	...	...	...	...	...
11	97	270	66	...	...	...	...	...	...	...
10	80	220	60	...	...	...	...	...	...	...
9	65	180	54	...	...	...	...	...	...	...
8	53	150	48	2 $\frac{5}{16}$	280	96 $\frac{1}{2}$	131 $\frac{1}{4}$	25	116	125
7 $\frac{1}{2}$	47	130	45	2 $\frac{1}{16}$	256	86 $\frac{1}{2}$	120 $\frac{1}{2}$	24	134	115
7	41	116	42	2 $\frac{1}{16}$	231	76 $\frac{1}{2}$	107 $\frac{1}{16}$	23	123	106
6 $\frac{1}{2}$	37	102	39	1 $\frac{1}{16}$	204	67 $\frac{1}{2}$	91 $\frac{1}{2}$	21	106	89
6	33	88	36	1 $\frac{3}{16}$	166	55 $\frac{1}{2}$	77 $\frac{1}{8}$	19	81	72
5 $\frac{1}{2}$	28	74	33	1 $\frac{1}{8}$	143	47 $\frac{1}{2}$	66 $\frac{1}{2}$	17	67	60
5	23 $\frac{1}{2}$	64	30	1 $\frac{1}{16}$	112	37 $\frac{1}{2}$	55 $\frac{1}{2}$	15	56	50
4 $\frac{1}{2}$	15	39	27	1 $\frac{1}{8}$	68	22 $\frac{3}{4}$	31 $\frac{1}{8}$	13	39	34
4	12	33	24	1	54	18	27	12	33	29
3 $\frac{1}{2}$	9	26	21	1 $\frac{1}{16}$	48	15 $\frac{1}{16}$	23 $\frac{1}{16}$	11	28	24 $\frac{1}{2}$
3 $\frac{1}{4}$	8	22	19 $\frac{1}{2}$	1 $\frac{1}{8}$	35	11 $\frac{1}{2}$	17 $\frac{1}{16}$	10	23	20
3	7	18	18	1 $\frac{1}{16}$	30	10 $\frac{1}{8}$	15 $\frac{1}{16}$	9	19	16 $\frac{1}{2}$
2 $\frac{3}{4}$	5 $\frac{1}{2}$	15	16 $\frac{1}{2}$	1 $\frac{1}{8}$	25	8 $\frac{1}{2}$	12 $\frac{1}{4}$	8 $\frac{1}{2}$	16	14
2 $\frac{1}{2}$	4 $\frac{1}{2}$	12	15	...	...	...	...	7 $\frac{1}{2}$	13	11 $\frac{1}{2}$
2 $\frac{1}{4}$	3 $\frac{3}{4}$	9	13 $\frac{1}{2}$	1 $\frac{1}{16}$	21	7	9 $\frac{1}{2}$	6 $\frac{1}{2}$	11 $\frac{1}{4}$	10
2	2 $\frac{3}{4}$	7	12	...	...	...	...	5 $\frac{3}{4}$	9	8
1 $\frac{3}{4}$	2	5 $\frac{1}{2}$	10 $\frac{1}{2}$	...	17	5 $\frac{1}{2}$	7 $\frac{1}{4}$	5	6 $\frac{1}{2}$	6
1 $\frac{1}{2}$	1 $\frac{3}{4}$	4	9	...	...	...	...	4	4	4
1 $\frac{1}{4}$	1	2 $\frac{1}{2}$	7 $\frac{1}{2}$	...	14	4 $\frac{1}{2}$	6	3 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{3}{4}$
1	...	1 $\frac{3}{4}$	6	...	...	...	...	2 $\frac{3}{4}$	2	1 $\frac{1}{4}$

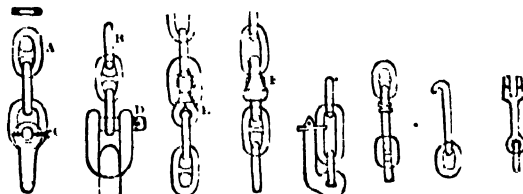
CHAIN CABLES are iron chains used in lieu of hemp cables for anchoring vessels. The liability of hemp cables to be destroyed by the alternate action of air and water, and especially by chafing in rocky anchorage ground, led M. Bougainville to suggest the idea of substituting iron as early as 1771; but the idea was not taken up till 1808, when Mr. Slater, a surgeon in the navy, obtained a patent for a chain cable. But chain cables, like many other "new" things, are old things invented again. When Cæsar was in Gaul, the Veneti, on the coast of Brittany, used iron chains for their anchors instead of ropes (Cæsar, "De Bell. Gal.," iii. 13).

Their introduction resulted in a great saving of expense, labour, and stowage, besides giving the advantage of greater durability than any rope then known. In 1811 a Captain Brown, of the West India merchant service, first used chain cables in the ship *Penelope*, of 400 tons.

The first contract with her Majesty's service for the supply of chain cables was made in 1811, about which date the links were formed without being twisted; and what is known as the "stud link" was then introduced. (This link is shown at A and B in figs. 1 and 2.) The "stud" prevents the link from closing and elongating under a severe strain; it also separates the adjoining links so as to prevent them from becoming entangled or "jumbled." In small cables this "stud" is occasionally dispensed with, the links being then made proportionately shorter, or what is known as "close linked."

The adoption of the chain cable was slow in its progress, and some degree of uncertainty as to its efficiency appears to have been entertained, the notation "chain cable" being made with the vessel's character in "Lloyd's Register

Book" of 1815, and for some years following. They were finally adopted in her Majesty's service in 1840. Their use caused various rearrangements on board of ships for the "letting go," "stoppering," "veering out," and "heaving in" of the chain (see figs. 5 and 6, 7 and 8); while in order to deal with the casualty of cutting the cable, it was made in lengths of from 12 $\frac{1}{2}$ to 15 fathoms, and provision made for readily connecting or separating these lengths by means of a shackle (see C and D, figs. 1 and 2). In cables supplied to her Majesty's service a swivel (see E, figs. 3 and 4) is also formed in each length. In 1860, on account of the unreliable quality of many of the chain cables supplied to merchant vessels, an inquiry was held



Figs. 1 and 2, Large Shackle. Figs. 3 and 4, Swivel. Figs. 5 and 6, Senhouse Slips for Inner Ends of Chain Cable. Figs. 7 and 8, Claw Stopper.

before a Select Committee of the House of Commons, and an important Act of Parliament, 27 and 28 Vict. c. 27, with reference to anchors and chain cables, was passed in the session of 1864, and amended by the 37 & 38 Vict. c. 51, passed in 1874. It provides that for the better security of lives and property in sea-going ships, any corporation or public body duly licensed by the Board of Trade.

may erect suitable apparatus and machinery for testing and stamping anchors and chain cables, and enacts that it shall not be lawful for any maker or dealer in such articles to sell any chain cable whatever or any anchor weighing more than 168 lbs., unless such has been previously tested and stamped in accordance with the provisions of the Act, under a penalty not exceeding £50. These precautions have insured to the merchant service the same securities as to safety which had long been enjoyed by her Majesty's navy. These testing machines are situated near the principal manufactories of chains and anchors, and also at some of the principal seaports of the United Kingdom. For a considerable time the practice was to make the weld of the link at one of its ends, but this is now done at the side abreast of where the stud is placed; this places the weld at the strongest part for withstanding the strain to be borne. The testing is carried out by first selecting and cutting off a short piece (about six links) out of each length of chain; this piece is subjected to a "breaking strain," and the remainder is then proved to the "Admiralty test," which is considered to be sufficient to insure the soundness of the workmanship, as the breaking strain has proved the quality of the iron used; the stud, being subject to a compressive strain only, is usually made of cast-iron.

Steel wire cables are now made in large quantities; they can be made as flexible as the best hemp, are three times as strong, and by being stretched at two thirds of the former weight of the cable is got rid of.

CABOT, SEBASTIAN, was the son of John Cabot, or Cabotto, a native of Venice, who resided occasionally in England. Sebastian was born at Bristol about 1477. When only nineteen years of age he was included with his two brothers in a patent, dated 5th March, 1496, granted by Henry VII. to John Cabot, his father, for the discovery and conquest of unknown lands. About a year after the date of the patent Sebastian Cabot sailed in a ship equipped at Bristol, named the *Matthew*, and on the 24th of June he first saw North America, probably the coast of Labrador, about lat. 56°. Another voyage was made by Cabot, but we have no details as to its results; and a third appears to have been made to the Gulf of Mexico in 1499. Soon after the death of Henry VII. Cabot was sent for by Ferdinand, king of Spain, in which country he arrived in September, 1512; but after some negotiations for conducting an expedition of discovery, which ended in nothing, he returned to England. In 1517 he was employed by Henry VIII. in conjunction with Sir Thomas Perte, to make another attempt at an Atlantic passage. It appears that on this voyage he reached lat. 67°, and it must have been on this occasion that he entered Hudson's Bay, "and gave English names to sundry places therein." But of this, like all the rest of Cabot's adventures, no details have been preserved. It is only known that the malice or timidity of Sir Thomas Perte, and the nervous conduct of his crew, compelled him to return. After this voyage Cabot again visited Spain, where he was named by Charles V. Pilot Major of the kingdom, and intrusted with the duty of carrying on all projects of voyages of discovery. A company having been formed at Seville to trade to the Moluccas, Cabot was selected to take the command. The expedition sailed in April, 1526, and proceeded across the Atlantic. Cabot explored the river La Plata and some of its tributaries, discovered forts in the most favourable positions, and endeavored to colonize the country. He returned to Spain in 1531, where he resumed his old office, and is known to have made several voyages. In 1548 he resolved to return to his native country. Edward VI. was then on the throne of England, and received Cabot with great favour. Cabot died at London in 1557. (*Life and Discoveries of Sebastian Cabot*, London, 1869.)

CABUL, CABOOL, or KABUL, which has been the capital of Afghanistan since the time of Timoor Shah,

about 100 years ago, is situated at the western extremity of the spacious and fertile Logar valley, on a river of the same name. The district around the city may fairly be described as the orchard of the East; fruits of the most luxuriant kind growing here in a profusion unknown elsewhere, while willows, poplars, and other trees form groves and hedgerows. Cabul itself is 150 miles from Peshawur, 82 from Ghuznee, and 300 from Candahar. Two ranges of hills, offshoots of the Hindu-Kush, meet at the south-west corner of the city, and partially screen it from view. A narrow gorge separates these hills, and through it flows the Cabul River, while by its side runs the highroad from Candahar and Ghuznee. At the gorge is a fortified bridge across the river, which, as it flows through the town, is also crossed by a brick structure connecting the business quarters. On the hill overlooking the south-eastern corner of the city, and commanding beautiful views over the plain, is built the Bala Hissar, or fortified palace of the capital, which played so important a part in the troubles of 1879-80. It is 900 yards long from east to west, and 800 wide, surrounded by a masonry wall flanked at intervals by towers. It was within the Bala Hissar that our unfortunate envoy, Sir Louis Cavagnari, was killed. The palace garden, called the Sherpoor, or Sherpur, where the British occupying force was stationed, is in the plain a mile to the north-east of the city. Here are very strong intrenchments, and the position is one easy of defence against great odds. The houses of Cabul are but indifferently built, sometimes of mud or bricks, but generally of wood, to avoid the consequences of earthquakes. The city is divided into quarters, and subdivided into sections. The latter are inclosed and entered by small gates, which are closed on the occasion of war or tumult, and the place is thus converted into as many fortifications as there are sections. There are two principal bazaars, running parallel to each other from east to west; and besides the shopkeepers these are paraded by a vast number of itinerant traders. On a hill near the city, surrounded by large beds of flowers, is the tomb of the Emperor Baber, whose body was brought here from Agra, at his death in 1530, to be interred. In the burial-place is also the tomb of a Georgian bishop, who died at Cabul some 300 years ago, and of an Englishman who died here in 1666. The city is 6400 feet above the sea-level, and is very cold; but the climate is often fine and healthy. Snow generally covers the hills around about the beginning of October, but in the plains it seldom snows before December, and does not then disappear until the middle of February, when the wet season commences. This usually continues until April. The rest of the year is dry.

The *Ortoptannum* or *Ortoptana* of the accounts of Alexander's march to India is by some thought to be identical with Cabul. Ptolemy mentions a people situated in this position by the name of *Kabolita*. Owing to its extremely advantageous position, both for military and commercial purposes, it is probable that it has been a place of importance from very early times. About the year 1773 the seat of the Durrani government was removed from Candahar to Cabul, and the population, which probably did not then exceed 20,000, largely increased. In 1839 an English army, under Lord Keane, escorted Shah Soojah into the city, though this prince was not popular. Lord Keane, with a large part of the Indo-European garrison, was withdrawn within a few months, and the most ordinary military precautions were omitted. In November, 1841, an outbreak took place, and Sir Alexander Burnes and other Englishmen, after a desperate resistance, lost their lives. On the 6th of January the garrison evacuated the town, and of the whole force but one reached Jellalabad to tell the tale of the fearful retreat. In September of the same year General Pollock occupied Cabul, and the great bazaar, Char Chata, was destroyed as a punishment for the

murder of our envoy. One of the stipulations of the treaty concluded with Afghanistan after the war in 1879 [see AFGHANISTAN] was that a British envoy should reside at Cabul. Sir Louis Cavagnari was selected, but within two months he and his escort were killed. The city was afterwards occupied by Sir Frederick Roberts, but the British forces were withdrawn in 1880 when Abdurrahman had proved himself capable of maintaining order in the country.

CABUL' RIVER. See AFGHANISTAN.

CACA'O is a tree (*Theobroma cacao*) belonging to the order STERCULIACEÆ. It is a native of South America and the West Indies, and is cultivated not only in those countries, but also in the tropical parts of Asia and Africa. The seeds yield cocoa and chocolate. The following, according to Payen, is the percentage composition of good shelled beans before roasting:—52 cacao-butter; 20 albumen, fibrin, &c.; 2 theobromine; 10 starch; 2 cellulose; 4 inorganic matter; and 10 water, besides small quantities of colouring matter and essential oil. The seeds, roughly crushed, are known as "cocoa-nibs;" in this state they are purest, but require two hours' boiling, unless previously pounded in a mortar. When crushed between rollers, the seeds are called "flake-cocoa." "Chocolate" is prepared from roasted seeds, shelled, and converted into paste; sugar, vanilla, &c., is then added. "Cacao butter," or "oil of theobroma," is obtained by pressing the heated seeds. The kernels of the seeds yield half their weight of oil. It has been lately introduced into the British Pharmacopœia, and is "well adapted, from its consistency, blandness, and freedom from rancidity, for the preparation of suppositories, for which purpose it is officinal. It is also used as a basis for pessaries, as an ingredient in cosmetic ointments, and for coating pills" (Bentley & Trimen's "Medicinal Plants," 1880).

CACHAR (*Kachar*), a district in the Chief-commissionership of Assam, British India, lying between 21° 11' and 25° 50' N. lat., and between 92° 26' and 93° 29' E. lon. The area is 3750 square miles, and the population 210,000.

The district occupies the upper portion of the valley of the Barak. It is surrounded on three sides by lofty ranges of hills, being only open on the west towards Sylhet. These mountain barriers rise steeply from the narrow plain, overgrown with dense green jungle, and broken by a few hill torrents and white cascades. Besides this background of noble scenery the valley itself presents a picturesque appearance. In the centre, from east to west, runs a wide rolling stream, navigable by steamers, and dotted with many native crat. On both sides, from north and south, low spurs and undulating ridges run down almost to the water's edge, with fertile valleys between. These lower hills, and the many isolated knolls which rise up all over the valley, are now covered with trim tea-gardens on the lower slopes; the carefully-kept rows of tea-bushes, always above flood-level; half-way up, the coolie lines; on the summit, the planter's bungalow. The lowlands, wherever possible, are under rice cultivation. The cottages of the people are buried in groves of tufted bamboo and shady fruit-trees.

The great natural source of wealth to Cachar lies in its forests, which are practically inexhaustible. The two most valuable timber-trees are jarul (*Lagerstromia regineæ*) and nageswar (*Mesua ferrea*). The staple crop of Cachar is rice, which yields three harvests in the year.

The tea-plant was discovered growing wild in Cachar in 1855, and the first grant of land for a tea-garden was made in the following year. Reckless speculation in the promotion of tea companies led to a severe depression, which reached its crisis about 1868, but since that date the industry has recovered itself, and now makes rapid and regular progress. The land for tea-gardens has been acquired direct from government, either on long leases or by sales in fee-simple.

The climate of Cachar differs from that common to Eastern Bengal in being less hot and more damp. The rainy season lasts from April to October, and during the remaining months of the year dense fogs are of frequent occurrence. The average mean temperature throughout the year is about 77° Fahr., the range of variation being 32°. The average annual rainfall is 111 inches. As lying within the mountainous tract that bounds North-eastern India, Cachar is especially exposed to earthquakes.

The prevailing diseases are—fevers, diarrhoea, dysentery, cholera, and small-pox. Intermittent fever usually appears every year after the cessation of the rains. In recent years, by reason of the spread of cultivation and the adoption of sanitary measures, the general health of the people has sensibly improved.

CACHOLOIT. See SPIRUM WHALE.

CAC'ODYL or **ARSENDIMETHYL**, $\text{As}(\text{CH}_3)_2$, is a spontaneously inflammable liquid, known as Alkarsin, or Cadet's Fuming Liquid. This substance and its compounds, most of which have been worked out by Bunsen, are inflamed at once in the air, and produce vapours of the most terribly poisonous character. Some of these compounds have been proposed for use in shells for annihilating armies, but, fortunately for the credit of civilized warfare, have not hitherto been employed for this purpose. Three oxides of cacodyl are known—oxide ($\text{As}_2\text{C}_4\text{H}_{10}\text{O}$), dioxide ($\text{As}_2\text{C}_4\text{H}_8\text{O}$), cacodylic acid ($\text{AsC}_2\text{H}_3\text{O}_2$). This acid forms salts called cacodylates. It also forms compounds with chlorine, iodine, sulphur, and cyanogen.

CAC'TUS is the name given by Linnaeus to a group of plants, considered by him to form a single genus, but now elevated to the rank of an order, called Cactacæ. The habit of the Cactacæ is remarkable. They have a very succulent stem, in which the woody system is developed in but a small proportion compared to the whole mass. Usually the stem is angular or deeply channelled; occasionally it is destitute of both angles and channels, but in that case is mostly either much compressed, as in the *Opuntia* tribe, or leafy, as in the *Epiphylla*. The greater part of the species have stems which are more or less elongated, but in some they are spherical, as in the whole genus *Melocactus* and *Echinocactus*. Whatever may be the form of the stem, they usually bear upon their surface little tubercles, which at an early age lose the leaves. These organs, however, rapidly fall away, and are succeeded by tufts of hairs or spines hooked backward at the ends, and then the cacti have the appearance of being perfectly leafless.

Cacti are chiefly found in the tropical parts of America, a few species only extending beyond these countries; as, for example, to Canada, and to the highlands of Chili and Mendoza. A species of *Rhipsalis* is found in South Africa, Mauritius, and Ceylon. They principally occur on hot dry rocks or plains where the commoner forms of vegetation could not exist. Their stems are filled with an abundant insipid, wholesome fluid, and their fruit is succulent, and in many cases superior to that of European gooseberries. In cases of fever in their native countries they are freely administered as a cooling drink, and being bruised they are esteemed a valuable means of curing ulcers. *Opuntia tuna* and *Opuntia coccinellifera* are the species which nourish the cochineal insect. Cacti are much planted round houses as fences, which neither man nor animals can easily break through. They are not unfrequent in the dry forest lands of Brazil, but are said never to occur in the damper parts of the country. In stature they vary greatly, many of them having small creeping stems. Others rise like candelabra, while a few elevate their tall and deeply channelled leafless trunks far above the stunted vegetation of the sterile regions they inhabit, reaching sometimes the height of 30 or 40 feet.

To enable them to endure the excessive drought to which they are naturally exposed, they are furnished with an unusually tough skin, the evaporating pores or stomates of

which are few in number. This prevents their losing the scanty moisture which they collect from the burning soil, and enables them to sustain the full ardour of the brightest equinoctial sun without inconvenience.

By attending to the natural state of these plants we learn these points which it is most necessary to attend to in their cultivation. A cactus should be placed in a damp stove, exposed to all the light that can be collected without being concentrated. When it begins to grow it is watered, at first gently, afterwards copiously, with water holding manure in solution. This practice is continued for three months, when the quantity of moisture is diminished and the temperature lowered, but exposure to light is still attended to, till at last the plant sinks to rest. In this state it is kept till the season for again forcing it into growth shall have returned, when it is subjected to a repetition of the same treatment as before. If cacti are to be propagated, their branches or joints, if they have any, are cut off, a little dried, and then placed in a hot and damp place, when they strike root immediately. De Candolle has pointed out how important is this property in changing the character of lava from a stony mass into a most fertile soil. On the slopes of Etna, wherever a crack is perceived in the lava, a joint of an opuntia is thrust in. Roots are produced which extract nourishment from the rain and organic matter that collect, the rootlets expand, and the lava is broken up into fragments.

The order Cactaceæ belongs to the cohort Ficoidales among the Polypetales. The flowers are regular, with numerous calyx-lobes, petals, and stamens. The ovary is syncarpous, inferior, one-celled, with parietal placentas and horizontal ovules. The order is divided into two tribes. In the first, *Echinocactæ*, the tube of the calyx is produced beyond the ovary, and the stem is covered with warty ribs or elongated processes with spines at the apex. This tribe includes *Melocactus*, *Mammillaria*, *Echinocactus*, *Discocactus*, *Cereus*, *Phyllocactus*, *Epiphyllum*. In the second tribe, *Opuntia*, the tube of the calyx is not produced beyond the ovary, and the stem is branching and jointed. This tribe includes *Rhipsalis*, *Nopal*, *Opuntia*, and *Pereskia*.

CADDIS-FLIES is the popular name for the Tricoptera, a suborder of the NEUROPTERA. These insects are chiefly remarkable for the singular habits of their larvae, which are long soft-bodied grubs, with only the head, the thorax, and the six legs attached to the thorax horny. To protect this soft body they construct cases of various materials. Some employ grains of variously coloured sand to cover these cases; others use small fresh-water shells, and thus carry about with them a little museum of the coverings of aquatic mollusca of different kinds; others form their cases of small fragments of branches or reeds. These cases are usually open at the ends. The caddis-worm adheres to the inside of this case in part by means of a pair of hooks at the end of the abdomen, and in part by the third pair of legs. In their pupal state they become torpid; but before becoming pupæ, the larvae, to keep out their enemies, and at the same time to allow free ingress to water, so necessary for their very existence, form a grate across the mouth of the case. This portcullis, as it has been well called, is spun across each end, and is formed of a silk spun from the anus of the larva. Degeer has described one of these grates. It is formed by a small, thickish, circular plate of a dark-coloured silk, which becomes hard, and exactly fits the end of the case, being fixed a little within its margin. It is pierced all over with holes, arranged in concentric circles, and separated by ridges, which run from the centre to the circumference, somewhat like the spokes of a wheel. Although for a considerable time quiescent in their pupal state, about the close of it they can move; they are furnished with an apparatus to pierce through the grating which imprisons

them, otherwise they must perish in the water. The head of the pupa is furnished in front with two hooks; with these, before their last change, they make an opening in the grate. Having escaped from this, the pupa mounts in the water to the surface, and emerges from it. She then creeps up some plant, her antennæ and legs each inclosed in a separate envelope; the perfect insect then gradually bursts from her case. In external appearance the perfect insect presents a striking resemblance to a moth. The wings, four in number, are large, membranous, and hairy, and when at rest they lie close to the body, the hind pair being folded; the longitudinal veins are united by only a few transverse veins. The prothorax is very short. The antennæ have numerous joints, and are long and bristle-like. The mouth is unfitted for mastication, as the mandibles are rudimentary and the palpi only are developed; the maxillary palpi are five-jointed or less, the labial palpi are three-jointed. The legs are long and thin; the tibiæ are furnished at the tip with long, movable spurs, these spurs existing often in the four hind legs, beyond the middle of the limb; the tarsi are five-jointed. Many species of caddis-flies are known, about 200 having been found in England. The larvæ, under the name of caddis-worms, make excellent bait for ANGLING. As an example of this suborder, the perfect insect and larva of a species of the genus *Limnophilus* is figured in the Plate NEUROPTERA.

CADE, JOHN, generally known as *Jack Cade*, an Irishman, who pretended to be a bastard relation of the Duke of York, and assumed the name of Mortimer. Shakspeare has made him known to us as "Jack Cade." The insurrection which he headed broke out in Kent in June, 1450, and had its origin in the dissatisfaction occasioned by the conduct of the Duke of Suffolk. Suffolk had ceded Maine to the uncle of Queen Margaret, the French king Charles VII., as part of the stipulations of the marriage treaty, and as a bribe for peace he had caused the virtuous Duke of Gloucester (the king's uncle) to be murdered, and the ruin of the government in England prevented succours being sent to France, where the HUNDRED YEARS' WAR was rushing to its fatal conclusion—the total expulsion of the English from France, with the exception of Calais. Not only all the northern conquests from Edward III. to Henry V. were being lost one by one, but the ancestral duchies of the south, held by England ever since the marriage of Henry II. with Eleanor of Guienne, were in the occupation of the enemy. In the next year (1451) all was over. Meanwhile Suffolk was impeached, banished by the king with a view to save his life, but murdered as he fled beyond sea. The scene is vigorously reproduced in the second part of Shakspeare's "Henry VI." (act iv.) The Bishop of Chichester, who had actually conducted the French cessions, was torn in pieces by an infuriated mob. Risings occurred in many parts, and especially in Kent. Cade was a soldier of some experience; he had served in the French wars, and soon assumed the leadership of some 20,000 Kentish men. With this force he encamped on Blackheath, 17th June, 1450, and sent in to the royal council the "Complaint of the Commons of Kent," demanding a change of ministry, administrative and social reforms, careful economy in the national finance, and freedom of election. The council rejected the "Complaint," and prepared for civil war. Cade issued a second petition, most valuable as showing the state of England at the time, called the "Requests by the Captain of the Great Assembly in Kent," further pressing for reduction of the wasteful expenditure, restoration of good government, and banishment of profligate favourites, &c. This, too, was refused by the court. These authentic papers give a very much higher view of the purpose of the insurrection than the popular tradition burlesqued by Shakspeare in the play referred to above, where Jack Cade's views of government are chiefly that "there shall be in England seven halfpenny loaves sold for a penny, the three-

hooped pot shall have ten hoops, and I will make it felony to drink small beer," and the like. (The best edition of the papers is by Mr. W. Durrant Cooper.) On the 1st of July (having previously defeated a small force sent against him under Sir Humphrey Stafford, who was slain) Cade entered London. On the 3rd he caused the Lord Say and Sele, one of the detested court minions, to be beheaded, and also the sheriff of Kent. The plunder of their property excited the citizens against him, and he was forced to withdraw, while a proclamation of pardon from the primate dispersed most of his followers to their homes. Cade again assembled a few followers at Rochester, but finding his force too feeble to effect any object he fled, and was pursued and slain by a certain Iden as he attempted to reach the Sussex coast on 11th July, and his head was placed on London Bridge.

CADENCE, in music, is the completion of a phrase or rhythmical period. A full close, *authentic* or *perfect cadence*, the most complete of these figures, and which is almost invariably used on this account as the termination of a composition, or of any very important part, is produced by the harmony of the dominant of the key for the time being resolved upon the common chord of the key-note. A half close, or *imperfect cadence*, is the converse of this, when the passage is made to end on the dominant chord, preceded either by the common chord of the key-note or by some other chord, leaving the composition, though at a satisfactory pause, still evidently unfinished. A church close, or *plagal cadence*, is almost limited to ecclesiastical use, and is far from possessing the absolute finality of effect of the authentic cadence; in it the chord of the subdominant replaces that of the dominant as the precursor of the common chord. Finally, an interrupted close, or *interrupted cadence*, is when the course of the passage leads towards an authentic cadence, but at the last moment breaks away from it, with the effect of a Cæsura in poetry. The most common interrupted cadence is when for the final common chord of the key-note the common chord of the submediant is substituted. Subjoined are illustrations:—



Interrupted Cadence.

The last illustration can scarcely convey the effect of an interrupted cadence, the charm of which consists in the unexpected avoidance of the perfect cadence; and therefore the greater the completeness and the greater the length with which the passage leads to the perfect cadence, the greater the surprise when it is skillfully turned aside. In modern music it becomes increasingly common to use imperfect and interrupted cadences for all subordinate parts, reserving the perfect cadence for the close of the composition, or at most for the termination of one of the main divisions.

CADER ID'RIS, a mountain in the county of Merioneth, Wales, of which the highest peak reaches 2914 feet. It is situated 5 miles S.S.W. of Dolgelly, and there is a very extensive view from its summit over Shropshire and St. George's Channel. It is composed of basalt, Cambrian slates, and other trap rocks. The name signifies "Chair of Idris."

CA'DIZ (*Cádiz*), a large commercial town on the S.W. coast of Spain, in the province of same name. Population at last census (1877), 65,028. It is much exposed, and liable to sudden changes of temperature. On an average there are ninety-nine wet days in the year, during which 22 inches of rain fall. It was formerly called Cales in England.

The city is built on the extremity of a narrow tongue of land, in the island of Leon, and is surrounded on three sides by water. On the N.E. is a deep capacious bay between the peninsula and the mainland, which is defended by four forts. The entrance to the bay is intricate and dangerous, from the sandbanks and sunken rocks with which it abounds. The inner part is protected by an extensive mole, and affords good anchorage; but the water is not sufficiently deep to allow large ships to come quite up to the town. On the opposite side of the bay from Cadiz is the port of Santa Maria, which is the principal depot for the wines of Xeres. The city is strongly fortified. It has five gates, only one of which is on the land side. It is in form nearly a square, the sides of which are about $1\frac{1}{2}$ English mile. The streets are regularly laid out, well paved, and lighted; in some parts they are narrow, but not generally so, and most of them cross each other at right angles. The town is well supplied with water by an English company. There are several squares, one of which, that of San Antonio, is very handsome, two cathedrals, a custom-house, several hospitals, churches, convents, and an opera. Cadiz has given title to a bishop since 1264; the church of Santa Cruz then became the cathedral. The new cathedral, finished in 1870, cost about £350,000.

Cadiz at one time enjoyed the monopoly of the Spanish trade with South America and the West India lands, but lost this lucrative advantage by the opening of direct communication with Seville, Malaga, Barcelona, Alicante, &c., and by the connection of Bilbao with Madrid by railway. The geographical position of Cadiz, however, not only as the nearest port to South America, but as the largest harbour on the whole seaboard of Western Europe, must necessarily always give it a great maritime importance.

The *caraca*, or royal dockyard, contains basins and slips for the construction of vessels of the largest size. There are much life and bustle in the streets, and considerable exportation of sherry wines. The prices of these wines range from £10 to £200 per butt. Many of the cheaper kinds are low, spurious compounds made up with molasses, German potato spirit, and water, to which some colouring matter and a small quantity of wine are added. Cadiz imports colonial produce from Cuba, Puerto-Rico, and the Philippine Islands; and cocoa, hides, cochineal, indigo, and other produce from South America. Linens, silks, and woollen cloths, coals, iron hoops, tin, glass, hardware, and earthenware, butter and cheese, are imported from England, Germany, and France; staves are supplied by the United States; and timber is imported from Russia and Sweden. The chief articles of export, besides wine, are salt, fruit, oil, wool, cork, and quicksilver. The export trade amounts to over £2,000,000 per annum, the largest item being of course for wine, of which about 8,000,000 gallons are exported. Nine-tenths of this quantity finds its way to Great Britain or her colonies. About 1200 ships, of 350,000 tons, enter the port annually, nearly one-third being British. As much as 4,000,000 fanegas of salt are annually exported, a fanega being equal to rather more than $1\frac{1}{2}$ bushel, English measure. The manufactures consist of soap, glass-ware, coarse woollens, and linens, cotton and silk fabrics, and hats; there are also some sugar-refineries and tanneries.

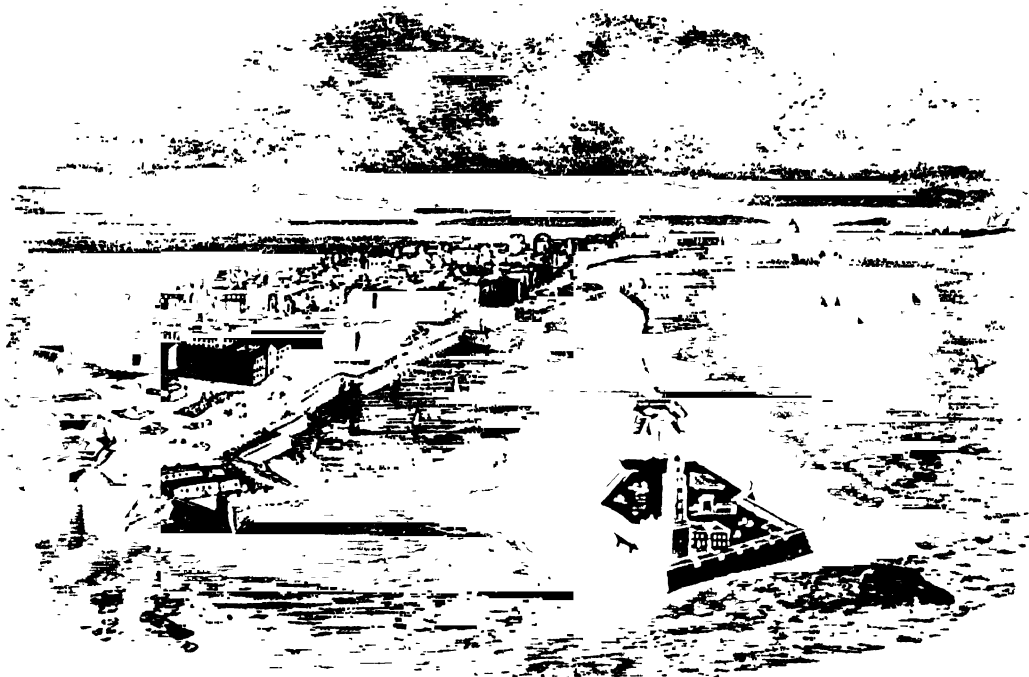
Cadiz was founded by the Phœnicians many centuries before the Christian era. Its Phœnician name was *Gadir* or *Gadeira*, which was changed into *Gades* by the Romans, under whom it became a municipium, and one of the richest commercial towns in the empire. The city was carried

by assault, pillaged, and burned in 1596 by Lord Effingham. It was again attacked in 1702, but not with equal success, by the Duke of Ormond and Sir George Rooke in conjunction with the Dutch. It was invested, in 1810, by the French forces under Marshal Victor. The garrison held out till 12th August, 1812, when, in consequence of the successes of the British troops, the French raised the siege. The French troops, under the Duke of Angoulême, took possession of the city on the 3rd of October, 1823, and held it until the summer of 1828. The revolution which drove Queen Isabella from the Spanish throne commenced in Cadiz on 18th September, 1868, when the admiral, officers, and crews of the vessels belonging to the royal navy lying in the port pronounced against the Bourbon rule, and were joined by the garrison and many of the inhabitants.

CADMIUM, a peculiar metal discovered in 1818 by Thomeyer. It occurs in ores of zinc, from which it is usually obtained. It is more volatile than zinc, and comes

over in the first sublimate from the ores. It has the colour of tin, is brilliant, and susceptible of a fine polish. Its fracture is fibrous, and it crystallizes readily in regular octahedrons; while solidifying, its surface is covered with arborescences like fern leaves. It is soft and easily bent; it stains substances upon which it is rubbed, like lead. When bent it gives a peculiar crackling noise, like tin. It is very ductile, easily drawn into wire and bent into thin leaves. Its specific gravity after fusion is 8.604, but when beaten 8.691. Cadmium melts below a red heat, and at a temperature a little below that of boiling mercury it boils and distils unchanged. The vapour of cadmium has no particular odour. Like tin, it is slowly acted upon by the air, but is eventually tarnished to a whitish-gray. Its atomic weight is 56, and its symbol Cd. It forms alloys with copper, mercury, and platinum. The pure metal is reduced from the oxide by distilling with powdered coal.

Cadmium combines with several other elements. With oxygen it forms two oxides, a suboxide (Cd_2O), and a



Cadiz.

peroxide or cadmium oxide (Cd_2O). The former is a green powder; the latter may be obtained in purple crystals. Cadmium and chlorine combine to form cadmium chloride, which in the hydrated form is crystalline, soluble, and efflorescent. This chloride combines with many other metallic chlorides, forming double salts. Cadmium and sulphur form a yellow sulphide, which occurs native as Greenockite; this sulphide (Cd_2S), when precipitated from solution, forms a beautiful yellow pigment, which melts at a strong white heat, and then crystallizes in thin plates. Cadmium and phosphorus form cadmium phosphide, a gray brittle substance which burns with a bright flame when heated. Cadmium and iodine form cadmium iodide (CdI_2), hexagonal tubular crystals, colourless, transparent, and of pearly lustre; they are readily soluble and fusible. Cadmium and fluorine form a slightly soluble fluoride (CaF_2).

The various acids combine with oxide of cadmium to

form salts, the general properties of which are, that a considerable number of them are soluble in water, and the solutions are in general nearly or quite colourless; the insoluble salts are also commonly devoid of colour, the sulphide being an exception. Cadmium is known in analysis as the only metal forming a yellow sulphide insoluble in sulphide of ammonium. It is thrown down from the solutions of its salts by zinc in the metallic state. The nitrate is a crystal; the carbonate is a white powder; the sulphate and the acetate are both crystals.

CADMUS or **KADMOS** was the legendary founder of Thebes. He was the son of Agenor, king of the Phœnicians, and was sent in search of his sister Europa, who had been carried off by Jupiter under the form of a bull. Cadmus proceeded to Boeotia, where, in obedience to the oracle, he formed a settlement on a spot pointed out by a heifer which he had followed thither from Phœnis, and which lay down by the streams of Dirce. He had, however,

in the first place, to kill a fierce dragon which guarded the place, and on sowing the monster's teeth, as he was directed to do, a host of armed men sprang from the ground, and fought with one another till all but seven were slain. These seven joined Cadmus in founding Cadmeia, subsequently the citadel of Thebes; hence the Thebans were called Sparti, "sown-men." (Ovid, "Metamorph." ii.) Cadmus was the father of Semele, amongst many other children. Some contend with Herodotus for the Phœnician origin of the traditions, others refer them to Egypt, but many moderns regard Cadmus as a Pelasgian divinity. To Cadmus is attributed the invention of seventeen of the letters of the Greek alphabet; the remaining eight were added by Palamedes and Simonides (Plin. "Hist. Nat." t. vii. c. 56). Cadmus and his wife were believed not to have died, but to have been changed by Zeus into serpents, and so placed in the Elysian fields.

CADODUAL, GEORGES, the famous CHOUAN leader of Brittany, who led the forlorn hope in favour of the expiring Bourbon monarchy and priesthood of France. He was taken prisoner with arms in his hands in 1794, and sent to the galleys. He made his escape and reappeared amongst his devoted peasants. Immediately the important rising in La Vendée, under La Rochejaquelein, Stofflet, and Cadoudal, broke out, and force after force of the Republic was annihilated, before General Hoche, with mingled firmness and justice, dealing out pardons and severity according as they were deserved, brought the revolt under. Not less than 100,000 perished in that series of sanguinary conflicts. Cadoudal, unvanquished, retired into Brittany, and early in 1795 an English fleet lay off Quiberon, binging him arms and emigré volunteers. Though this expedition was promptly and successfully attacked by the Republicans, yet Cadoudal and his brave Bretons remained unconquered, and in their guerilla fastnesses unconquerable. In 1799 a serious plot was organized against the First Consul (Napoleon), and Georges Cadoudal was the heart and soul of it. Napoleon discovered the whole affair, and with that curious combination of high policy and incapability of appreciating character which renders his career so fascinating a problem, he offered the brave Royalist with the one hand high command in his army, and with the other—a bribe! Cadoudal's answer was a renewed and still more dangerous plot, which he himself at length conducted in Paris in disguise. He was taken and executed, 25th June, 1804. PICHÉGRU, who was also mixed up in the plot, was found dead in prison before his trial, probably assassinated for fear of the dangerous revelations as to Napoleon's previous career which in despair he might have made. Cadoudal was only thirty-three when executed, having been born in 1771.

CADUCEUS, a staff of laurel or olive with a representation of two snakes twisted about it. The caduceus was the symbol of Mercury, to whom, according to the fable, it was given by Apollo, in return for the lyre which Mercury had presented to him. It was also the badge of the heralds of ancient Greece. In its oldest form it was merely a bough, like the Greek *hiketerion* and the Roman *supplicia*, twined about with white wool. Afterwards a white or gilded staff, with imitations of foliage and ribbons, was substituted for the old rude symbol.

CADUCIBRANCHIATE (Lat. *caducus*, falling off; and *branchia*, gills) is the name applied to those members of the class AMPHIBIA, such as frogs, toads, and newts, which, before they reach maturity, lose the gills by which they breathed in an immature state.

CÆCIL'IA. See ORTHOMORPHA.

CÆCIL'IA METEL'LA could not find place in this work if it were not for the magnificent tomb, the finest architectural work of the Campagna of Rome, situated on the APPIAN WAY, about 2 miles from the Porta S. Sebastiano, which is so often wrongly attributed to her.

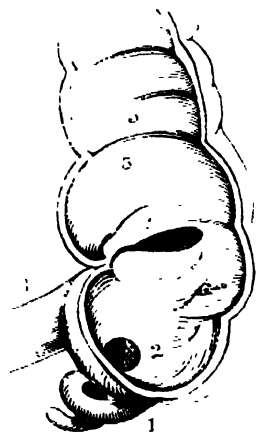
She was the daughter of L. Metellus (surnamed Dalmaticus for his subjugation of the Dalmatians in his consulship, B.C. 119), and the wife, first of L. Æmilius Scaurus, and then of the famous dictator L. Cornelius Sulla. In 81, while Sulla was celebrating his triumph, she fell mortally ill, and to avoid polluting himself by her death, and thus obliging himself by religious law to abandon public concerns for a time, he divorced her, with her full consent, if not at her request. That religious necessity was the only cause of this apparently inhuman act was shown by the sumptuous funeral with which he honoured her memory.

The tomb mentioned is that of a much later Cæcilia Metella, namely of the wife of the Triumvir Crassus, and the daughter of Q. Cæcilius Metellus Creticus, so called from his successful expedition to Crete when he was consul, B.C. 69. The tomb is a noble circular tower, 65 feet in diameter, on a square pedestal, only the brick cours of which remain, the original stone facings having disappeared. A fine frieze runs round the building. In the thirteenth century it was a stronghold of the Gaetani.

CÆCIL'US STATIUS was a Roman comic poet, the immediate precursor of Terence. He was a Milaese Gaul and a slave, and bore the name of Statius. He received the name Cæcilius on attaining his freedom; perhaps one of the great plebeian Cæcilian gens helped him from servitude, but the point is not clear. He wrote many dramas, but only a few fragments are preserved, by quotations in the works of Cicero, Aulus Gellius, &c. We have the titles of about forty. The Romans ranked him with Plautus and Terence, so that we may consider the loss of his works as a great misfortune. He became very friendly with Ennius the poet, and died B.C. 168, one year after that author. It is perhaps unnecessary to remark that he must not be confounded with P. Papinius Statius, the distinguished author of the "Thebaid," the second greatest Roman epic, which was translated by the poet Pope. Statius died A.D. 96, more than two centuries and a half after Cæcilius Statius.

CÆCUM (or in full, *caput cæcum coli*, "the blind end of the colon") is, in Man, that rounded end of the large intestine, or *ascending colon*, beyond the point at which the *ileum*, or small intestine, enters it. The reason why the ileum does not enter at the extremity of the colon, but leaves this blind end, is not yet known; nor has there yet been discovered any use for a curious elongated blind process or tubular prolongation which is given off from the cæcum, called, from its shape, the *vermiform appendage*. Doubtless both are survivals of a structure previously active in lower forms. The ileum projects a little into the cæcum, and is stretched transversely within the latter into two lips or folds, forming the *ileo-cæcal valve*. The *villi* of the intestines cease with this valve, the large intestine having no villi. Professor Michael Foster ("Physiol.," 8th edition, London, 1879) says: "Of the particular changes which take place in the large intestine we have no definite knowledge, but it is exceedingly probable that in the voluminous cæcum of the herbivora a large amount of digestion of a peculiar kind goes on." This refers to the digestion of cellulæ, which certainly in this order takes place somewhere in the large intestine. Foster hints his belief (certainly borne out by the cessation of the villi) that digestion ceases with the cæcum, and absorption now becomes the main function of the large intestine. In Fishes there are many cæca as a rule, but of very variable number in different species, ranging from one to sixty or more, and always arranged at the pyloric (stomach) end of the intestine. The large intestine is represented only by a slight dilatation of the gut at its anal extremity. In Reptiles begins the division into "mid gut and hind gut," following Gegenbaur's nomenclature ("Comparative Anatomy," edit. Ray Lankester, London, 1878), and a cæcal appendage at once appears at this point, feebly developed in serpents but

more firmly in fluids. In Birds there is generally a pair of cæci; indeed only in the woodpecker and parrot families are they absent. They vary from very short appendages to the long tubes found in domestic fowls and geese. The intestine is as yet of about the same size throughout its course, but in mammals the final part (the "hind gut") becomes of much greater size, and is denominated the large intestine. The cæcum is here not a mere appendage, but the more or less developed end of the large intestine. The size of the cæcum is held to vary with the food. It is observed that carnivorous animals have very short cæca,



The cæcum laid open showing the entrance of the ileum. 1, 2, The vermiform appendage and its aperture. 3, 4, Ileum and ileo-cæcal valve. 5, 5, Saccular or pouch-like folds of the cæcal (large intestine).

and in bears and weasels there is no cæcum. Herbivorous animals, on the other hand, have the long voluminous cæca mentioned above. From the constantly acid character of cæcal contents it is surmised that a special acid fluid may be secreted here, but this is not at all known with certainty. (See Bernard, "Liquides de l'Organisme," &c.) The shape also of the cæcum varies. In Rodents the large intestine decreases in size from the ileo-cæcal valve to the tip, whereas in primates the portion next the valve continues to dilate into a wider rounded shape, and the tip becomes more and more differentiated, until in the highest orders, as in Man, it becomes a tubular prolongation. The apparently distinct vermiform appendage is therefore in reality the "blind end of the cæcum," and the cæcum is the preceding portion of the bowel, distended abnormally instead of gradually tapering to its point.

CEDMON, the first English poet, was a cowherd on the abbey lands of Whitby. He was an earnest man, and the heathen songs at the festival of the time jarred upon him. He would retire to watch the cattle, a necessary precaution in those lawless times, and there brood over these lines which sang of sacred things, and which came to him he knew not whence. "A voice said, 'Cædmon, sing.' He said, 'I cannot sing; for this curse left I the feast and cure hither.' The voice answered, 'However that be you have to sing to Me.' 'What shall I sing?' 'The beginning of created things.' This is Bede's account of the miracle which converted a cowherd into a poet so accomplished that when he stood before the Abbess Hilda next day he was enabled at once to turn into verse all the pieces of Scripture set before him. Hilda immediately took him into the monastery; this was probably shortly after 664, the date of the great Synod of Whitby, which had given the supremacy over the Celtic Church to the Church of Rome. Bede says, "Others after him strove to compose religious poems, but none could do with him, for he learnt not the art of poetry from men, not of men, but of God." Fervent Celtic scholars taught him from the Chaldee Scriptures, that he might verify in the vernacular; and as his song began with *Ginnes's*, "In the beginning," which in Chaldee is *b' Cædmon*, they called him Cædmon. His real name we do not know; probably he had none, he was but a cowherd. Cædmon's "Paraphrase" in Old English (commonly called Anglo-Saxon) deals with the creation, the war in heaven, the fall of Satan, and the conquests of hell, as the strong

"angel of presumption." Then he paints the flood and the other main events of the Old Testament down to Belshazzar's feast. A fragment on Christ, also in the same single MS. which alone remains to us, is less firmly authenticated. In fact of the earlier poem Mr. Sweet ("Anglo-Saxon Reader," Clarendon Press, Oxford, 1881) says: "It has been for a long time admitted that the collection of Biblical poems attributed to Cædmon is really the work of several hands." Professor Earle (same series, 1880), however, considers "it is possible that they may be his work, having undergone, in the process of copying, a partial modification." However this be, the singer was one of the most celebrated men of his generation. The language is archaic, the oldest form of what the folk themselves called *Englisc* (English), the verse without art, simple to rudeness. But the imagery is noble and full of poetry. Professor Henry Morley ("First Sketch of English Literature," 8th edition, Lond., 1881) gives translations of several passages. The soliloquies of Satan are most astonishingly forcible. Thus he cries, in quite Miltonic verse, spurning the willing obedience of the angels to God—

"Why shall I for His smile serve Him,
Bend to Him thus in vassalage?
I may be God as He!"

As a specimen of the language in this earliest form we append the original of these lines, from Sweet—

"Hwæt seæl ic æfter his hyldo theowian
Bigan him swiðes giongordomes?
Ic mæg wesan god swā he."

"Everywhere Cædmon is a type of the new grandeur, depth, and fervour of tone which the German race was to give to the religion of the East," says Professor J. R. Green, in his "Short English History." It is ascertained that the "Paraphrase," such of it as is due to Cædmon, was written between 670 and 680; and with the help of Mr. Sweet's careful glossary it needs but a light labour, especially to anyone a little conversant with Teutonic speech, to gain a fair idea of the greatness of a work now over twelve centuries old. The one MS. of Cædmon was discovered by Archbishop Ussher (1580-1656), and is now in the Bodleian Library. It is of the tenth century, contains illustrations, and bears no name of author or writer. It is recognized as the "Paraphrase" solely by the way in which it tallies with the full account given by Bede, and by its intrinsic excellence. Bede was a child when Cædmon was writing.

CÆLIAN HILL, THE. See **ROME**.

CAEN, the capital formerly of Basse Normandie, now of the department of Calvados in France, stands at the junction of the Odon with the Orne, on the left bank, and 7 miles from the mouth of the latter. It is 147½ miles N.W. from Paris on the railway from Paris to Cherbourg, and contained 36,310 inhabitants in 1882. The earliest name of this city was Cathon or Cathem, from which the modern one is said to be derived. When Charles the Simple in 912 ceded Neustria to the Normans, Caen was a large and important town. The Conqueror and his wife Matilda resided in it for some time, and contributed greatly to its embellishment. In 1316 Edward III. took it, after a siege, and plundered it. The English took it again in 1417, and held it till 1450, when it capitulated to Count Dunois. Since that time it has belonged to the French.

Caen is situated in a wide open plain; it is of semicircular form, and is traversed by the arms of the Odon. The appearance of the town from a distance is imposing, both in consequence of its extent and of the numerous towers and spires that rise above it. The houses are well built, of excellent stone, which is found in quarries near the town, and many of them are of an ancient style of architecture. The streets are regularly laid out and clean; the finest are those

of St. Jean and St. Pierre, which cross each other at right angles and lead right through the town. The harbour is formed by the bed of the Orne, the banks of which are lined with quays. The river itself is principally used by small steamers and coasting vessels, and much care is taken to keep it clear of sandbanks, to which it is subject. For the convenience of larger craft, a canal, 12 feet deep, connects Caen with the sea at Oyestreham, at which place are locks and a floating dock, in which vessels of 500 tons can conveniently lie.

Caen contains several squares, the finest of which are the Place St. Sauveur and the Place Royale: the latter is adorned with a statue of Louis XIV. The public buildings are interesting, as well for their architecture as for their historical associations; and owing to the solidity of the Norman masonry, most of them date from an ancient period. The cathedral, one of the finest ecclesiastical edifices in Normandy, is the ancient Church of the Abbey of St. Etienne, which was founded by William the Conqueror between 1061 and 1070. The abbey, called also Abbaye aux Hommes, being outside the town, was regularly fortified in the fourteenth century. It was sacked in 1562 by the Protestants, on which occasion they demolished the tomb and dispersed the bones of the Conqueror, who was buried in the Abbey Church; a second monument, erected soon after, subsided till 1742, when the few remains that had been recovered were removed into the interior of the abbey, and a third monument erected over them; this in its turn was demolished at the Revolution of 1793. It was in this church that, as the Conqueror was being buried, the man Asselin claimed the land on which it was built as his own, and obliged the bishop to pay what he considered was the value of the grave on the spot. The abbey buildings are now occupied by the college. The Church of La Trinité belonged to the former Abbey of La Trinité, called also Abbaye aux Dames, which was founded by Matilda in 1066. Matilda was buried in this church; in 1562 her coffin and bones shared the same fate as the Conqueror's. A second monument erected to her in 1708 was destroyed in 1793. The buildings of this abbey have been turned into an hospital since 1823. The Church of St. Pierre was thoroughly restored in 1875. Its tower, erected in 1308, is considered a masterpiece. The Church of St. Jean dates from the beginning of the fourteenth century, and is remarkable for its tower, which leans sensibly to the north. The Church of St. Nicholas is considered the purest specimen of the Norman architecture of the eleventh century extant. It has long been desecrated, and is now used for army purposes. The castle, commenced by the Conqueror, finished by Henry I., and afterwards repaired by Louis XII. and Francis I., is now used as a barrack, and the Chapel of St. George and the hall of the Norman Exchequer have become warehouses. The Church of Notre-Dame, the prefect's hotel, and the court-house are elegant modern structures. Among other remarkable objects are the Hôtel de Ville, which contains the public library of 60,000 volumes and pictures by Perugino, Rubens, and others; the museum, the botanical garden, the fish-market, the abattoir, and the granite bridge over the Orne. There are an English church and a French Protestant church. The city contains many beautiful promenades, most of which run along the banks of the rivers and canals, and are bordered with fine trees.

Caen is the seat of tribunals of first instance and of commerce, also of a high court and a university academy, which have jurisdiction over the departments of Calvados, Manche, and Orne. In connection with the academy there are in Caen faculties of law, science, and letters, a secondary school of medicine, and a college. Among its numerous other literary and scientific establishments, mention must be made of the schools of hydrography and of the institution for deaf-mutes.

Caen is famous for the manufacture of lace, which

employs about 2000 females, angora and woollen gloves, and cutlery. Linen, woollen, and cotton stuffs, hosiery, porcelain, oil, paper, and leather are also made. The town is a depot for salt, and has large timber and shipbuilding yards. About 800 vessels arrive annually, of which 160 are freighted with salt. The other articles of commerce are corn, wine, brandy, cider, clover-seed, hemp, horses, fat cattle, butter, iron, hardware, mill-stones, building stone, and granite for paving. It was the birthplace of Huot, bishop of Avranches, born in 1613; the poets Clement Marot, Malherbe, Ségrais, and Malfilâtre; the Oriental scholar Bochart, and the composer Auber. Beau Brummell lived here for many years, and died in the lunatic asylum called L'Hospice du Bon Sauveur, as also did Bonaparte, the secretary and friend of Napoleon I.

CAER-CAR'ADOC or **CRADDOCK HILL**, a mountain in the county of Salop, 1200 feet high, one of a range of hills composed of lower Silurian rocks. The ruins of a British camp, said to be that which Caractacus defended against the Romans, exist upon Caradoc. The Kymric word *Caer* (*ka er*, or *kajr*, Lat. *castrum*) is a very frequent prefix, and denotes a fortified place or castle.

CAERLE'ON, a thriving town in Monmouthshire, 5 miles N. from Newport and 158 from London, stands upon the right or western bank of the Usk. There are some iron and tin works. Caerleon was the *Isca Silurum* of the Anglo-Romans, and was then of great importance, being the capital of the province of *Britannia Secunda*. At a later period, it was celebrated as a seat of learning, and in the twelfth century Giralduus Cambrensis gave a lively, though perhaps exaggerated, picture of its wealth and magnificence. Several Roman antiquities have been dug up in the town and its vicinity, and in several parts the Roman walls are still visible. An elliptical concavity, the longest diameter measuring 74 yards and the shortest 61, and 6 yards in depth, is situated in a field close by the Usk, near the S.W. side of the town. The country people call it Arthur's Round Table, but no doubt it is the remains of an amphitheatre. Stone seats were discovered on opening the sides of the concavity, and in 1706 an alabaster statue of Diana was found in it. Caerleon was the seat of an archbishopric in the earliest days of Christianity in Britain. At the councils of Sardis, 347 A.D., and of Rimini, 359 A.D., it had a representative. The see was transferred to St. David's in the eleventh century, and is now included in that of Llandaff. Two citizens of the town, Aaron and Julius, suffered martyrdom during the persecution of Diocletian in the third century. Population, 1500.

CAERMAR'THEN. See CARMARTHEN.

CAERNAR'VON. See CARNARVON.

CAERPHIL'LY, a town in the county of Glamorgan, about 7 miles N. from Cardiff, and 180 from London by the Great Western Railway. There are some remains of an ancient Norman castle, which was one of the finest in Wales. The scenery is grand and picturesque, mountain ranges opening on the E. and W. There are manufactures of linsey-woolsey, shirtings, and checks. In the vicinity are collieries and iron-works. Population, 2500.

CÆSALPIN'IA is a genus of plants belonging to the order LEGUMINOSÆ. *Casalpinia brasiliensis* is a West Indian tree. *Casalpinia echinata*, a Brazilian plant, is a prickly tree, with yellow and red blossoms, smelling deliciously, like lilies of the valley. Both these species yield a red wood possessing tonic properties. [See BRAZIL WOOD.] Another species, *Casalpinia sappan*, the sappan wood of India, yields a fine red dye, used in colouring cottons and woollens. *Casalpinia coriaria* grows in the West Indies and tropical America. Its pods are used in tanning leather. This substance is known in commerce as *diri-diri*. There are thirty-eight species, natives of the colder regions of both worlds, consisting of trees or high climbing shrubs, with bipinnate leaves. The calyx-tube

is short, bearing a disc. There are five petals, only slightly unequal; the stamens ten, free, with versatile anthers; seeds few, in a compressed thick pod. *Cassalpinia brasiliensis* has recently been placed by Benthams and Hooker under the genus *Peltophyllum*.

CÆSAR, the *cognomen* or family name of a branch of the illustrious Julian gens or house. Four different explanations of the origin of the name have been proposed:—1. That in the language of the Moors *Cæsar* means elephant; and that as one of their ancestors had killed one the family continued to bear the name. 2. That the name was given to some ancestor of Caius Julius, or to himself, because he had been at birth cut (*cæsus*) out of the womb; hence, in surgery, the expression *Cæsarian operation*, sometimes had recourse to on the living mother, but oftener when a mother has died in an advanced state of pregnancy. If it were thus with *Cæsar*, his mother *Aurelia* must have survived. She was alive when her son invaded Britain. This theory of the name is not, however, much more satisfactory than the first. *Froude* does not even mention it ("Cæsar," London, 1879). 3. That it had been given to some "Julius" who had been born with a strong growth of hair on his head. The Latin for long hair is *cæsius* (Sanskrit, *kesa*). This seems the most trustworthy explanation. 4. That a "Julius" had received the name because of the colour of his eyes. In Latin the noun for eyes of light gray, or cats' eyes, as they are sometimes called, is *cæsius*. It was not unusual for the family names among the Romans to be derived from some personal peculiarity; examples of this are *Naso*, *Fronto*, *Calvus*, &c. The Julian gens was one of the oldest patrician houses of Rome, and the branch of it which bore the name of *Cæsar* deduced its origin from *Iulius*, the son of *Lineas*. The Julian gens is traced back historically to A.U.C. 253, or B.C. 591; but the first person who bore the distinctive family name of *Cæsar* is probably *Sextus Julius Cæsar*, who was quaestor A.U.C. 552, and from whom *Caius Julius Cæsar*, the dictator, may be traced through five descents.

In pursuance of the will of *Caius Julius Cæsar*, Octavian afterwards the Emperor *Augustus*, who was grandson of the dictator's sister *Julia*, took the family name of *Cæsar*. *Therms Nerva*, a "Christian," who was adopted by his stepfather *Augustus*, also took the name of *Cæsar*. *Cicero* and *Claudius*, his successors, were descended from *Julia*, the dictator's sister, as was *Nerva*, the successor of *Claudius*, in whose person the family of *Cæsar* became extinct. When *Hadrian* adopted *Julius Verus*, who was thus received into the imperial family, *Verus* took the name of *Cæsar*. *Spartianus*, in his life of *Julius Verus*, remarks, "Verus was the first who received the name of *Cæsar* only, and that not by will, as before, but pretty nearly in the same way as in our times (the reign of *Diocletian*) *Maximianus* and *Constantius* were named *Cæsars*, and thus designated as heirs to the empire." Thus the term *Augustus* under the later emperors signified the reigning prince, and *Cæsar* or *Cæsars* denoted the individual or individuals named out by the emperor's favour as being in the line of succession, being almost equivalent to the French *Dauphin* or our own *Prince of Wales*.

The fame of the great dictator so overshadows the name of *Julius Cæsar* that the reader may overlook other very worthy members of that family. To name only some of the chief, we have *Lucius Julius Cæsar*, consul B.C. 90, and next year consul during the social war, and author of the very important "Lex Julia," granting the franchise to the Latins and those Italian allies who had remained faithful during the war. He was put to death by *Marius* in 87 B.C., on account of his connection with the aristocratic party. His brother, *Caius Julius Cæsar*, shared his fate, after filling several distinguished offices in the state. It was the latter who was the orator of the family; his wit was proverbial, and he is one of the speakers in

Cicero's famous dialogue, "*De Oratore*." *Cæsar* the orator had a double nickname, "*Strabo Vopiscus*," whereof *Strabo* means "the squinter," and *Vopiscus* means "the surviving twin," one whose twin brother or sister had died at or before birth. The nephew of *Caius* the orator, and son of *Lucius* the consul, was also called *Lucius*, and he was uncle of *Mark Antony*, the great triumvir being his sister *Julia's* son. He too was consul, B.C. 64, and followed his father's aristocratic tendencies. He was one of *Cæsar's* legates in Gaul in B.C. 52, but after the dictator's murder he sided with the senate, and was proscribed by his nephew, *Mark Antony*. His sister *Julia* (*Antony's* mother) obtained his life. His son *Lucius* was one of *Pompey's* adherents, and afterwards served with *Cato* in Africa against his great relative the dictator. He surrendered and was executed, but not, it is believed, by *Cæsar's* orders.

Lastly, *CAIUS JULIUS CÆSAR*, grandfather of the dictator, whose descendants form the democratic group of *Cæsars*, quite distinct from the aristocratic family whose members have been noted above. This *Caius* was an unknown man till about the middle of the second century, B.C. He married a noble Roman lady, a *Martia*, one of the reputed descendants of *Ancus Martius*, fourth king of Rome. By her he had three children—*Caius Julius Cæsar*, *Sextus Julius Cæsar*, and *Julia*. Of these *JULIA CÆSAR* became the wife of *MARIUS*, quite a mésalliance as far as blood went; but this branch of the *Cæsars* had evidently already split off from the old stock, and was taking the people's side. *SEXTUS JULIUS CÆSAR* was consul B.C. 91. *CAIUS JULIUS CÆSAR*, the eldest son, rose no higher than praetor, because he died somewhat suddenly at Pisa in B.C. 84, but he bears a higher interest than any personal to himself, as being the father of the great dictator, by *Aurelia*, one of the famous consular family of *Cotta*. *Aurelia* was an almost perfect specimen of the then nearly extinct type of the ancient Roman matron—haughty, spotless, noble, and dignified. For an account of the dictator himself see the next article.

CÆSAR, CAIUS JULIUS, the son of *C. Julius Cæsar* and *Aurelia*, was born B.C. 100, on the 12th of *Quintilis*, afterwards called *Julius* in his honour. His aunt *Julia* was the wife of *Caius Marius*. He had therefore as uncles *Sextus Julius Cæsar* the consul, and *Marius*, already no less than six times consul. When *Marius* in his old age was made consul for a seventh time, an honour he only enjoyed for a fortnight before his death, he marked his nephew for promotion, and gave him an appointment which reminds us of the boy-bishops of the middle ages. He made him *flamen dialis*, or priest of *Jupiter*, and a member of the Sacred College of *Augurs*, with a handsome income. *Cæsar* was only fourteen at this time, "a tall, slight, handsome youth with dark piercing eyes, a sallow complexion, large nose, lips full, features refined and intellectual, neck sinewy and thick beyond what might have been expected from the generally slender figure" (*Froude*, "*Cæsar*," Lond. 1879). Two years later his father arranged a match for *Cæsar* with a rich lady named *Cossutia*; but the lad had already formed his character, and on the death of his father (84 B.C.) he broke with *Cossutia* and married *Cornelia*, the daughter of *Cinna*, by whom he had a daughter, *Julia*. This connection with *Marius* and *Cinna*, the two great opponents of the dictator *Sulla*, exposed him to the resentment of the opposite faction. *Sulla* ordered him to divorce *Cornelia*, but *Cæsar* firmly refused. *Sulla* deprived him of his priesthood, and is said to have spared his life with great reluctance. *Cæsar* prudently left Rome.

He first served under *M. Thermus* in Asia, and distinguished himself at the capture of *Mitylene* (B.C. 80 or 79). In the following year he served under *P. Servilius Isauricus* in Cilicia. The news of *Sulla's* death brought him back to Rome, B.C. 78. After an unsuccessful impeachment of *Dolabella* for maladministration in his province, he retired

to Rhodes, and for a time became the pupil of Cicero's old master, the rhetorician Molo, *b.c.* 75. On his journey to Rhodes, with the retinue of a man of rank (for he had recovered his priesthood, &c.), he was captured by pirates, and taken to an island of Caria. There he was detained six weeks, while his servants went on to obtain his ransom; £10,000 in Roman money was demanded and paid. Cæsar had joined in the sports of the pirates familiarly enough, but frankly telling them they should all be hanged for their pains. He was as good as his word, and instantly seizing some armed vessels which he found on his landing when freed, he returned, captured the whole crew of pirates, booty and all, and took them to Pergamum, where they were tried and executed. He then went on to Rhodes. In the midst of his rhetorical studies he heard the mutterings of the coming storm so soon to burst into fury under Mithridates. Deserting Apollonius Molo's lecture-room, he crossed over to the continent, raised a corps of volunteers, and held Caria to its allegiance. "But for the young Cæsar, Mithridates would a second time have driven the Romans out of Asia" (Froude).

When Cæsar returned to Rome, *b.c.* 69, he was master of that eloquence so serviceable to him throughout his career, drawing applause even from the jealous Cicero. For his services in Asia he was elected military tribune (lieutenant-general). Cornelia dying, Cæsar married Pompey's cousin Pompeia, and in other ways connected himself with that great man. The following year he was *questor* in Spain, and on his return to Rome he was elected *censuræ* for *b.c.* 65. The office of *ædile* gave Cæsar an opportunity of indulging his taste for magnificence and display, by which he secured the favour of the people. Cæsar was now five-and-thirty years of age, and had enjoyed no opportunity of distinguishing himself in a military capacity; while Pompey, who was only six years older, was spreading his name and the terror of the Roman arms throughout the East. By a judicious application of money among the poorer voters, and by his personal influence among the people, who regarded him as their champion and the successor of Marius and Cinna, Cæsar became (*b.c.* 63) *Pontifex Maximus*, chief of the priesthood—the title still held by the Pope of Rome. This union of civil and religious functions in the same person, at least in the higher and more profitable places, was part of the old Roman polity. The office was the most coveted of all honours. It was held for life, was splendidly endowed, and had traditions of unequalled dignity. By a law just passed it was in the gift of the people, and Cæsar's majority excelled the votes given to all the other candidates combined (Suetonius).

At the time of the debate on the conspiracy of Catiline (*b.c.* 63), Cæsar was *prætor designatus* (*prætor elect* for the following year), and accordingly spoke in his place in the senate. He was the only person who ventured to oppose the proposition for putting the conspirators to death; he recommended their property to be confiscated, and that they should be dispersed through the different municipia of Italy, and kept under a strict surveillance. It was only Cato who could counteract the effect of this powerful speech. [See CATILINE.] The affair of Clodius' profanation of the *BONA DEÆ* mysteries, and the consequent divorce of the unfortunate Pompeia, which happened during Cæsar's *prætorship* (*b.c.* 62), caused no little scandal at Rome.

The year 61 *b.c.* was spent by Cæsar in his province of Southern Spain, where he speedily restored order, and hurried back to Rome to canvass for the consulship. The aristocratic party saw that it was impossible to prevent Cæsar's election; their only chance was to give him a colleague who should be a check upon him. Their choice of Bibulus was singularly unfortunate; for after unavailing efforts to resist the impetuosity of his colleague, he shut himself up in his house, and Cæsar acted as sole consul.

Cæsar had contrived to render ineffectual all opposition on the part of his opponents. Pompey was dissatisfied because the senate delayed confining his measures in the Mithridatic war; Crassus, who was the richest man in the state, and second only to Pompey in influence with the senatorial faction, was not on good terms with him. If Cæsar gained over only one of these rivals, he made the other his enemy; he determined therefore to secure them both. He succeeded in bringing about a reconciliation between Pompey and Crassus. It was agreed that there should be a general understanding among the three as to the course of policy. This is called the First Triumvirate. To cement their alliance more closely, Cæsar gave Pompey his daughter Julia in marriage. Cæsar also took a new wife on the occasion, Calpurnia, the daughter of L. Calpurnius Piso, whom he nominated one of the consuls for the ensuing year, *b.c.* 58. This union of Pompey, Crassus, and Cæsar destroyed the credit of Pompey, threw disunion among the aristocrats, and put the whole power of the state into the hands of one vigorous and clear-sighted man.

One of the most important measures of Cæsar's consulship was an agrarian law for the division of some public lands in Campania among the poorer citizens, and especially Pompey's veterans, still without their promised reward. He also ordered the *Acta Diurna*, which may be regarded as the first newspaper, to be published, recording the daily proceedings of the senate. He rearranged the collection of the taxes; and carried in the Assembly the great body of laws known as the *Leges Julię*, which in themselves are sufficient to immortalize him, providing for the inviolability of magistrates, purity of justice, fines on rapacious viceroys, &c.

The Roman consuls, on going out of office, received the government of a province for one year. Cæsar's opponents unwisely made another effort against him; they proposed to give him the superintendence of the roads and forests. Vatinius forthwith obtained for Cæsar, from the indignant people in Comitia assembled, the province of Gallia Cisalpine (North Italy) and Illyricum for five years; and the senate, fearing the people might grant still more, not only confirmed the measure, but added the province of Gallia Transalpine. From this moment the history of Rome presents a striking parallel to the condition of the French republic during Bonaparte's first campaigns in Italy. In both cases we see a weak republican administration in the capital involved in continual broils, which the rival factions are more interested in fostering than in securing the tranquillity and peace of the empire. In both cases we find a province of the distracted republic occupied by a general with unlimited power—the uncontrolled master of a territory which in extent and importance is equal to a mighty kingdom—a man of superior understanding and desperate resolves—a man who, under democratic institutions, behaved like a despot, governed a province at his pleasure, and established absolute control over his soldiers.

The Gallie provinces at this time subject to Rome were: Cisalpine Gaul (North Italy); and Transalpine Gaul, also called emphatically "*Provincia*," the Province (whence the modern Provence), whose capital was Narbo, now Narbonne. When Cæsar, in his "*Commentaries*," speaks of Gaul, which he divides into Aquitania, Celtica, and Belgica, he means *Gallia Comata* ("long-haired Gaul"), the Gaul which was then independent and which he conquered, exclusive of the *Provincia* already subject to Rome. Cæsar's campaigns in Gaul, which are the most eventful periods of his life, belong to the history of Rome. They comprise the time from the beginning of *b.c.* 58 to *b.c.* 51. He began by stopping the Helvetii, a Celtic nation who were emigrating from their native country, a part of modern Switzerland, with the intention of settling in the southern part of Gaul. He next totally defeated Ariovistus, a powerful German chief, at the head of an invading settlement, in what we now

call Franche Comté, with immense slaughter. Some of the fugitives escaped across the Rhine in boats, and Ariovistus among them. The campaign of 57 B.C. was against the Belgic Gauls, a powerful race of German origin, so Cæsar thought, who had been long settled in the country between the Rhine and the Séquana (Seine). The war was conducted with his usual vigour and success, though the resistance of some of the Belgic tribes, especially the Nervii, was most desperate. In the great battle with the latter on the Sambre, Cæsar was at one moment almost lost. Nothing saved him but his own coolness. When the army went into winter-quarters Cæsar set off, according to his custom, for Cisalpine Gaul, where his friends flocked from Rome to congratulate him on his successes. The senate, on receiving from the victorious general the usual official letters, ordered fifteen days of public thanksgiving to the gods, a period never granted before for any other general. At the same time the senate was burning with jealousy against this favourite of the people; and the bitterness of the aristocrats, Domitius Ahenobarbus, brother-in-law of the reactionary Cato, was put forward for the consulship. He openly declared that, once consul, he would recall Cæsar and repeal his laws. Cicero also spoke against Cæsar. The danger of a reactionary coup d'état was pressing. Pompey, Crassus, and Cæsar sat at Luca on the frontier of Cæsar's province, B.C. 56, with more than a hundred of the best senators. It was arranged that Pompey and Crassus should be consuls, that the first should then have Spain for five years and the second Syria, Cæsar retaining Gaul for five years beyond his present term, that is, ten years in all; and that Cæsar's soldiers should attend to vote, on no longer for soldiers still retained their civic rights, and all voting was by personal presence in the Comitia. It is indeed a perpetual puzzle to understand how, under such a clumsy system of legislation, the world could be governed. The party of order was so evidently united that Cicero at once left his aristocratic plotters and joined Cæsar. He addresses to Atticus regarding his previous error, *Me gressus meum in præsens*, "I have been own brother to an evil" (Cicero's "Letters"); for Cicero's opinion of politics was to be up in the winning side.

Cæsar's third campaign, 56 B.C., was against the Western Gauls, where the Veneti were a powerful, commercial, and seafaring people, who had numerous ships, in which they traded with Britain and other countries. After the defeat of the Veneti in a great naval battle which lasted all day, ending with the destruction of their fleet, to the number of 200 ships, Cæsar subdued the Morini and Menapii, the Belloaci, Calus, &c., and marched to the north and east, to the Elbe, now shrouded, although it could not fairly be said to be conquered; therefore the following year, 55 B.C., the campaign was carried on against some invading tribes of Germans upon the Moselle (Meuse) and the Rhine. They were defeated with great slaughter at Venloo. After the battle Cæsar constructed a bridge over the Rhine at Bonn, by means of piles driven in the bed of the river. He gives a full description of the process of building the bridge (c. 47). The bridge was finished in ten days, when Cæsar crossed across, and ravaged the country of the Saxonii. He crossed the Rhine after spending eighteen days on German ground.

He then made his first expedition into BRITAIN. The next year, 54 B.C., after making an excursion into Hlyricum, Cæsar returned into Gaul, where he had ordered a fleet to assemble at Portus Itius (between Boulogne and Calais) for his second attempt upon Britain. On his return from this expedition, owing to the bad harvest and scarcity of provision, he dispersed his legions in various parts of the country for the winter, a measure which proved nearly fatal to the Roman arms, as the Gauls attacked the separate camps, and it required all

Cæsar's skill to save them. One division entirely perished. Again a parallel suggests itself. Like Napoleon's generals, Cæsar's officers were so used to rely on their commander that they blundered when left to themselves.

The following year, 53 B.C., which was the sixth of Cæsar's government, symptoms of general disaffection manifested themselves throughout Gaul. This was a year of desultory though destructive warfare, during which Cæsar crossed the Rhine again. The disturbances at Rome in consequence of the murder of P. Clodius made Cæsar turn his attention towards that quarter. At the same time news came that Crassus had utterly perished in Asia with all his army; Julia, Cæsar's daughter and Pompey's wife, died, and what was perhaps worse, her child also. He would have been heir both to Pompey and to the childless Cæsar. The triumvirate was thus shattered, but as yet Pompey and Cæsar remained friendly. The Gauls thought the time was come for one great effort now while Cæsar was engaged in Italy. The Carnutes massacred all the Romans whom they found in the town of Genabum (Orléans). Vercingetorix, of one of the first families of the Arverni, was placed at the head of a confederacy of the whole of Celtic Gaul. Cæsar, hearing this news, set off in the middle of winter (beginning of 52 B.C.) for Gaul, and vigorously suppressed the insurrection. The great event of this campaign was the siege of Alesia, now a village called Saint Reine, and also Alise, near Lavigny, and Semur, in North Burgundy, 10 leagues N.W. of Dijon. For this celebrated siege of Alesia we must refer to Cæsar's own account. ("Gallic War," v.) Cæsar found himself besieged in his own lines, having to fight Vercingetorix, who had retired within the town, and the confederates, who pressed him in immense force from without. The most daring feat in the military annals of mankind was successfully accomplished. A Roman army, which could not at the utmost have amounted to 50,000 men, held blockaded an army of 80,000, and defeated, beat, and annihilated another army five times as large as their own. Alesia finally surrendered, and Vercingetorix several years later walked before the triumphal car of the conqueror at Rome; after which he was put to death in prison.

Cæsar's eighth and ninth campaigns (51 and 50 B.C.) were employed in the final subjugation of Gaul. By a remarkable mixture of firmness and even severity, with rewards and good government, Cæsar rendered his long-time enemies his most devoted friends. But more, as Cicero said in an oration of this time, it was not merely the annexation of a province, it was the dispersion of a cloud which had threatened Italy since the days of BREXITES, the constant paralyzing dread of an incursion of Gauls and Germans such as that which Marius had only a short time before been able to defeat with the greatest difficulty. The senate had rejoiced over every unfavourable rumour from Gaul, as we know from letters preserved; but dreading to make an open rupture with Cæsar, now admittedly the greatest man Rome had ever put forth, they decreed twenty days of thanksgiving for the complete conquest of Gaul. The people, enraptured with their favourite, made them sixty—an unheard-of honour. Cisalpine Gaul dressed out its towns with flags and flowers to receive him from his last campaign. While Cæsar was arranging the commands in Gaul, so as to leave the province in perfect order to his successor, the year 49 was running out. He had been promised the consulship for 48. But the senate, reinforced by Pompey, whose noble nature had at last succumbed to the ceaseless efforts to stir it into jealousy of his greater rival, and secure in the possession of two consuls of violently reactionary views, nerved themselves for a last effort. Pompey was ordered to Africa to avenge Crassus; Cæsar and he were each to provide a legion for the purpose from the armies of Gaul and of Spain respectively. When

one of Caesar's legions had been cut to pieces in 54, Pompey had given him one to replace it. This he now named as his own contribution; Caesar's force was therefore weakened by two legions. Caesar sent them to Rome without a word of protest, loaded with parting presents from himself. Further, the consuls, by a misuse of that manipulation of the calendar which the old irregularity of computing time caused to be necessarily a part of their duties, were able to arrange that Caesar's command should expire considerably before the election. The public assembly had years before agreed that he should be allowed to stand without leaving his command. Thus forcing him to come to Rome unarmed, as they thought, and at the same time issuing orders to Pompey to stay in Campania with Caesar's two legions, the senate trusted to be able to wreak their vengeance on Caesar. He offered to lay down his command without cavil if Pompey would do the same; the senate's reply was to name him a public enemy if he retained his command beyond a day to be named at a subsequent debate. Their attitude was now made quite clear by their avowed purpose to keep Pompey in command while Caesar had once more become a private citizen. Mark Antony and Longinus, tribunes, interposed their veto, which was by law final. The senate refused to accept the veto, a clear breach of law. Piso, Caesar's father-in-law, asked for time to go to him and explain, lest this sudden removal from a command yet unexpired, and given by a formal vote of the sovereign people, should drive Caesar into rashness; or at least that a deputation should be sent. The senate refused everything, and voted the state in danger. The tribunes and others fled to Caesar. Caesar, with but 5000 men, crossed the little Rubicon, whose stream bounded his province, and started instantly for Rome with his usual lightning swiftness at the close of January, 49. He even now paused at Ariminum (Rimini) offering to lay down his arms if Pompey started for his province (Spain), as he ought long since to have done. An evasive answer was returned, and Caesar marched on Rome, the aristocrats flying *en masse* to Pompey at Capua, and the towns opening their gates with extravagant rejoicings till Caesar's march became a triumphal progress. Italy breathed freely when the terrible incubus of the tyrannous oligarchy was shaken off. Pompey saw that all was over for the moment, and on 17th March sailed for Greece to raise an army, which was impossible in Italy, and to intercept the corn supplies by sea, on which Rome was entirely dependent. Caesar was master of the grateful Italy. His first object was to crush the senatorial party in Spain, where Pompey's legates had a large army. For Caesar this was the work of a few brilliant weeks, and leaving Spain entirely quiet, and investing Marseilles, which still held out, he returned to Rome by the beginning of winter. The feat would be incredible if told of any one but Caesar. Probably, for one reason, no commander except Napoleon ever exercised such fascination over his troops. But it is to be noted that except at Durazzo, Caesar never suffered a check, and all his victories were won with the least possible loss of life on his own side, two points in which he is altogether superior to his modern rival in strategy. Caesar's extraordinary reliance on his own good fortune is well brought out in Anthony Trollope's excellent sketch of his life prefixed to the "Caesar" in "Ancient Classics for English Readers" (8vo, 1870). He spent eleven days as dictator in Rome, crowded with legislation calculated to restore order from out the terrible confusion; and then at once started for his second great task, the overthrow of the aristocrats themselves in Greece. He had the greatest trouble in getting across, his opponents being masters of the sea; fortunately for him the incapable Bibulus was in command, and Caesar managed to slip by him with half his forces. It was months before Antony could elude the vigilance of the successor of Bibulus with the other half.

Caesar joined him on his arrival at Dyrrachium (Durrazzo), and at once invested Pompey's camp. All this time his enemies had been afraid to attack him, weak as he was. A vigorous and brilliant sortie of Pompey's cost Caesar 1000 killed and some hundreds of legionaries, with thirty-two standards. With his cool judgment he refused the frantic demands of his soldiers to be allowed to recapture these last, accepted the check and retired to Apollonia to gain reinforcements. Never was he greater than in this moment. As he hoped, Pompey was forced by his party to pursue him, and by August they were again face to face at Pharsalia in Thessaly. Caesar had 22,000 foot and 1000 horse; Pompey 17,000 foot, and allies in addition, and 7000 cavalry. The victory Caesar gained on 9th August, 48 B.C., was crushing and complete. The Roman aristocracy never recovered the blow; its power fell at once and for ever, and the face of the world was changed. M. Froude describes their camp in his picturesque yet accurate manner. "The camp itself was a singular picture. Houses of turf had been built for the luxurious patricians, with ivy trained over the entrances to shade their delicate faces from the summer sun; couches had been laid for them to repose on after their expected victory; tables were spread with plate and wines, and the daintiest preparations of Roman cookery" ("Caesar," p. 390). To this state of degradation had the great Roman families sunk. Their wealth, their power, their luxury, their fiddleness, and their cruelty have never been equalled; not even by that worthless class who in France brought down the avalanche of the great French Revolution. Now 15,000 men lay there dead upon the ground, and a large proportion of these were of the aristocracy. Caesar acted with the nobleness peculiar to him—*unique* indeed in that age. He not only allowed no executions amongst the 21,000 who came in to surrender, but he burned, unaltd, the whole mass of secret correspondence found in Pompey's tent.

Pompey fled alone to Egypt, calling at Mitylene for his wife and family. He had set Ptolemy Auletes king over Greece years before; his son was now on the throne, and Pompey hoped for a secure asylum. But the Egyptians had bribed the Roman garrison of Alexandria, had secured the young king, and were governing themselves in his name. They saw at once the opportunity of avenging themselves on their conqueror and of pleasing Caesar; and having induced him to land alone on a pretext, his head was cut off in the boat, midway to shore, in the sight of his family still on board the ship.

Caesar arrived in Egypt shortly after. Disputes in the royal family of Egypt and the interference of Caesar brought on a contest between the Romans and the king's troops, which ended in a new settlement of the kingdom by the Roman general. Here Caesar formed his intimacy with Cleopatra, the young queen of Egypt. (See CÆSARION.) The late king had named Cleopatra joint ruler with her brother, and Caesar insisted upon this will taking effect. Early in B.C. 47 Caesar moved into Pontus, and defeated Pharnaces, the son of Mithridates, who had overrun that province, hoping that Caesar was hopelessly involved in Egypt. This was the occasion of the famous despatch to the senate, *Veni, vidi, vici*, "I came, I saw, I conquered." It is now customary to doubt its authenticity, but it has passed into a proverb and earned immortality. He returned to Italy in the autumn, by way of Athens. At Brundisium he was met by Cicero (Plut. "Cic." 39), who was glad to make his peace with Caesar. On his return to Rome Caesar was named dictator for one year, and consul for the following year, with M. Lepidus. During the winter he crossed over into Africa—where the party of Pompey rallied under Scipio—gained a complete victory at the battle of Thapsus, and was again at Rome in the autumn of B.C. 46. A remarkable instance of his personal fascination occurred in connection with this African campaign.

His legions expected rest and reward, and murmured at the new campaign, which was to be immortalized by the fate of Cato. Sallust the historian was in command at Capua. They mutinied and almost killed him; they pursued him to Rome. Cæsar summoned them before him, and patiently heard their complaints. He then rose to reply, and began—"Citizens!" (*Quirites*). At this word, telling them that they were already in his mind discharged, no longer to be his "comrades" (*commilitones*) as heretofore, they burst into lamentations and entreaties for forgiveness, which they obtained only with the greatest difficulty. It is probably the only time in the history of man that a dangerous revolt of men with swords in their hands was quelled by one unarmed man with a single word!

Cæsar celebrated a quadruple triumph, for Gaul, Egypt, Pontus, and Africa. His clemency seems astonishing even at this distance of time. No difference was made between aristocrats and democrats; those who had borne arms against him he freely forgave, on the sole condition of the restoration of order. As soon as it began to be felt that this was not a mask for some ulterior designs the greatest joy prevailed. Nothing was too good for such a hero. He was made dictator for ten years, with power to nominate consuls, &c.; a new and more stringent censorship, under the title of Prefect of Public Morals, was created for him, that he might cope with the foul sink of patrician dissolute luxury. In return he allowed his own *Leges Juliae*, the reform of the magistracy, to remain no longer a dead letter; justice was once more unpurchasable. The calendar was reformed so thoroughly as to have needed but a slight revision to make it perfect. [See CALENDAR.] But Cæsar had yet another last campaign to undertake, and started from Rome in a carriage, in midwinter, for Spain, where the sons of Pompey had raised a dangerous force; taking with him his adopted son, the young Octavianus. This youth, so AUGUSTUS was really Cæsar's great nephew, being the grandson of the husband of Cæsar's only sister Julia (Julia married M. Atius Balbus, one of the commissioners for Cæsar's great agrarian law of B.C. 59, and their daughter Atia married C. Octavius, father of Octavianus, better known to us as Augustus.) It is no doubt to this intimate communion with the great dictator that was due the swift grasp of power with which Octavian seized the reins the next year. During the greater part of the year he was absent in Spain. The great battle of Munda, 17th March, in which 50,000 men are said to have fallen on the side of Pompey, terminated the campaigns of Cæsar, but he remained till the autumn providing for permanent future order.

Fresh honours awaited Cæsar on his return to Rome. His portrait was ordered to be on all coins; the month Quintilis was called Julius, &c. He was named the Liberator, and further was created Consul for ten years and Imperator (commander-in-chief) for life—giving him the military power of life and death, except in Rome alone. (This word *Imperator* was preferred by succeeding sovereigns to the title of Rex, king. Our word *Emperor* is not so much a translation as a modernization of the word itself.) The whole senate took an oath to watch over his life; Cicero was amongst the most abject on this score. Cæsar seems to have paid little heed to flattery, but went on with his plans for consolidating the great Roman dominion. He cut short the corn grants which kept numbers in idle readiness for revolt; he filled up the ranks of a greatly enlarged senate with Gauls, with provincials, even with representatives of freedmen, poor folk who had once been slaves, and by merit or the generosity of their masters had recovered freedom. The aristocracy were aghast. Cæsar forbade the absurdly costly banquets, the sedan chairs, the effrontery of the "gilded youth" of the day. He began, with Varro's help, public libraries in all large towns, had plans ready to begin for draining the Pontine marshes, for

cutting a better channel for the Tiber, for cutting the Isthmus of Corinth (the impediment of that age, answering to the Isthmus of Suez of our own); he started on a digest of the entire Roman law. Such work is simply amazing to read of, all crammed into some five or six months. The senate ordered his statue to be placed in all temples, rostra, &c., and on the Capitol itself, an eighth after the seven of the kings of Rome. Finally they formally pronounced him not man at all, but a god, *Divus Julius*; a temple was ordered to be built, and Mark Antony was named priest. But Cæsar knew well that these despicable flatterers were longing for his death, and openly spoke of the conspiracies he knew were surrounding him. He detected the snare in the final flattery of the offer from the senate to crown him King of Rome, and refused. The mob saluted him by the new title, he replied "I am not king, but Cæsar." On the 15th of February, at the festival of the Luperæalia, Antony formally offered to place a regal tiara on Cæsar's head. He said in a loud voice, "The Romans have no king but God," and ordered it to be placed on the head of the statue of Jupiter. An inscription on brass recorded the fact that the crown had been offered by the people and refused by Cæsar. It is necessary to record these facts to redeem the memory of a truly great man from the scandal and misrepresentation which has gathered round it.

At length the most dangerous of all the conspiracies was formed. At least sixty took part in it. One man thrust the full account of it into Cæsar's hand as he went down to the senate on the Ides of March (the 15th) B.C. 44; but he put it aside for later attention, on learning that it was personal. His statue fell as he left his house, the auguries were ominous, his wife Calpurnia had an awful vision of his death! To calm her he even consented to remain at home.

His own familiar friend in whom he trusted, Decimus Brutus, brother of his bosom companion Marcus Brutus, came to persuade him to come to his murder. Cæsar never went guarded nor armed, and knew no fear. As soon as he was seated in the senate, Cimber pulled his cloak as a signal, Cassius (not perhaps Caius, but another—*alter e Cassiis*, Sueton.) stabbed him from behind, and then the rest who had crowded round fell on him. Cæsar recognized his fate, and with true grandeur made no struggle, but wrapped his toga round him, drawing it over his head, so that he might fall decently, and sank down without a word at the foot of Pompey's statue. Suetonius expressly says so, and mentions only as a tradition that he said to Marcus Brutus in Greek, *Kai su tikhon?* ("and thou too, my son?") The famous "*Et tu, Brute,*" rests on no sufficient authority.

The fortunes of the conspirators and the ruin of the republic (which now sank for centuries into a military despotism) may be traced in such articles as ANTONY, AUGUSTUS, BRUTUS, CASSIUS, &c. Antony's speech at Cæsar's funeral, though not in Shakespeare's words, is a historical fact, and brought about the instant ruin of the guilty men who had destroyed the great patriot. It is impossible for any thoughtful man to pass by the testimony of the two greatest poets who have lived since Cæsar, on the guilt of his assassins. Shakespeare's "*Julius Cæsar*" is by most critics held to be his masterpiece, and is too well known for comment. Dante, in the lowest hell of his "*Inferno*," places the three arch-traitors of the world, whom the three-headed Lucifer crunches in his triple jaws—they are Judas Iscariot, and Brutus and Cassius. The most remarkable parallel thus suggested, the murder by treachery on a false accusation of aiming at kingship, and after a last supper where the conversation turned on death, &c., has been worked out by Froude in some powerful passages ("*Cæsar*," pp. 459 and 494).

The energy of Cæsar's character, his personal accomplishments and courage, his talents for war, his magnanimity,

and his capacity for civil affairs, render him perhaps the most remarkable man of any age. Thrice in this article has Napoleon been compared with Cæsar as a commander in the field; but even here his brutal disregard of his soldiers' health and lives is revolting when contrasted with the constant humanity of the great Roman. Dr. W. Smith ("Classical Diet.") justly says he was "at one and the same time a general, a statesman, a lawgiver, a jurist, an orator, a poet, a historian, a philologist, a mathematician, and an architect. He was equally fitted to excel in all, and has given proofs that he would have surpassed almost all other men in any subject to which he devoted the energies of his extraordinary mind." As a writer and an orator, he has received the highest praise from Cicero; and his "Commentaries," written in a plain, perspicuous style, are a model of their kind. (The eighth book is by Hirtius.) The three books of the "Civil Wars" were written by Cæsar, but the single books on the Alexandrine, African, and Spanish wars respectively are generally attributed to Hirtius. His poems, his works on the Latin language, his biographical sketch, the "Anti-Cato," and especially his "Auguries," are works often praised by contemporaries, and whose loss is irreparable. The "Commentaries" have passed through numberless editions. One of the best is the Stuttgart one of 1822.

CÆSAR, CAIUS and **LUCIUS**, the two grandchildren of the Emperor Augustus, died early, to the great grief of their grandfather. He had no son, and these were children of his only daughter Julia, by his confidential minister and friend Marcus Vipsanius Agrippa. [See AGrippa.] Lucius died at Marseilles A.D. 2, and Caius two years after, at Lycia in Asia, of a wound received in an Armenian campaign. The empire was therefore without an heir. Augustus adopted the young Tiberius, son of his third wife Livia Drusilla, by her previous marriage.

CÆSARĒA, the name of several towns, so called in honour of the Roman Cæsars. Of two towns in Palestine of this name, one was situated about 30 miles N. of Jaffa, and was the headquarters of the Roman administration. It was founded A.D. 22 on a site formerly occupied by *Turris Stratonis*. It had a magnificent harbour and many fine buildings, traces of which still remain. During the times of the Crusaders this town was one of their chief bases of operations. Its modern name is Kaisariyeh. The other, lying near the foot of Mount Hermon, about 20 miles N. of the Sea of Galilee, is distinguished by the name of Philippi (Matt. xvi. 13), having been repaired by Philip the tetrarch. It has been the seat of both Latin and Greek bishoprics, and possesses a famous ancient castle. The town is now in ruins, and is known as Pannias or Bannias.

CÆSARĒA or **KAISARIYEH** is also the name of one of the most important cities of Asia Minor, situated on the Kara-su, 160 miles E.N.E. of Konieh. It was a flourishing place in the time of the Romans, the ruins of whose city, as well as of a subsequent Mohammedan city, are near the present one. There are a castle, mosques, churches, and bazaars, and its enterprising inhabitants, who manufacture morocco leather and cotton, carry on an extensive trade in European goods and local produce with other places inland. Turks form the bulk of the population, which, including Greeks and Armenians, is about 12,000.

CÆSAREAN OPERATION, the name of one of the most dangerous operations in surgery, which consists in the removal of a child from the mother by means of an incision in the lower wall of the abdomen and in the uterus. It is rarely performed in Great Britain, but it is recognized as a lawful operation in certain extreme cases, and there are numerous instances recorded of successful operations, in which both the life of the mother and of the child have been preserved. Cæsar, or rather one of his ancestors, is said to have been born in this way, and to have received his name in consequence, such persons being then termed *cæsares*.

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CÆSARION was a youth who assumed to be the son of the great Julius Cæsar and Cleopatra, born during Cæsar's Egyptian campaign, B.C. 47. He was originally called Ptolemy, and was considered and treated as an Egyptian prince—some thinking his father to be Ptolemy, the brother and joint sovereign with Cleopatra. In B.C. 42 Augustus and the second triumvirate allowed the child to be called King of Egypt, and in 31 Antony further acknowledged his parentage, which Cleopatra now openly avowed in his new name. But later on Augustus had Cæsarion brought to Rome, and his story was thoroughly sifted and examined. He was condemned as an impostor and executed B.C. 30, shortly after the death of Cleopatra herself. It is almost provable that Cæsar was in too much anxiety at Alexandria to have had time for an intrigue of the kind alleged. See also CALPURNIA.

CÆSIUM, an alkaline metal resembling potassium, discovered in 1860 by Bunsen and Kirchhoff in certain mineral waters by spectrum analysis, the spectrum giving two characteristic blue lines. It forms an amalgam with mercury, and is the most electro-positive metal known. Symbol, Cs; atomic weight, 133.

CAFFARELLI, one of the most celebrated singers known. His career was amongst the most extraordinary, for he rose, simply through his beautiful singing, from the position of a very poor peasant to that of a wealthy duke. His real name was Gaetano Caporano, and he was born at Bari, near Naples, in 1703. He became a chorister, and gained the favourable notice of the musician Caffaro, whence his sobriquet of Caffarelli. Caffaro obtained possession of the boy, and, shameful as it now seems to us, had him mutilated that his boyish soprano voice might be preserved—a career which, when offered to the great Haydn, was indignantly refused. He was sent by his patron to Porpora, already well grounded in his art, and expecting to receive from the great teacher the finishing lessons necessary for perfection. It is one of the best authenticated musical anecdotes that Porpora wrote rapidly a page full of manuscript, simple exercises for the voice, and that for several years the unlucky lad was kept by the stern master to the study of this one page. When it was done with, however, Porpora dismissed Caffarelli with, "Go, my son. I have nothing more to teach you. You are the greatest singer in Europe." His debut at Rome, in 1724, was the beginning of a series of triumphs enough to turn the head of the most modest artist. Caffarelli's vanity being fully equal to his extraordinary musical accomplishments, the result may be imagined. The most ludicrous anecdotes abound. Thus when Louis XV., in 1750, gave him a snuff-box, he showed the messenger his collection of such presents, and significantly pointed out that the king's was the poorest of all—"not even his portrait upon it." The courtier replied that the portrait was in honour reserved for ambassadors. "And all the ambassadors in the world would not make a Caffarelli," replied the artist. He made a huge fortune, purchased a dukedom, and built a mighty palace. He lived to be eighty, and sang up to within ten years of his death.

CAFFEIC or **CAFFETAMINE ACID** ($C_8H_6O_5$) exists in coffee, which owes to it a part of its odour when roasted. It is present, in combination with calcium and magnesium, to the extent of from 3 to 5 per cent. It colours peroxide of iron green, and can be obtained in a colourless crystalline mass. When heated it gives off the odour of roasted coffee. The alkaline caffeates are of a pure brown colour, without any admixture of green, and by evaporating the solutions they are obtained in the state of brown horny masses.

CAFFEINE or **THEINE** ($C_8H_{10}N_4O_2$) is a weak basic substance forming the active principle of tea and coffee. It is also found in Paraguay tea (*Ilex Paraguayensis*) and in guarana (*Paulinia sorbilis*). It is extracted

from tea or coffee by boiling water, in which it is very soluble. From a concentrated solution it crystallizes in slender flexible needles which resemble silk; when they are obtained by slow spontaneous evaporation they are long fine prisms, which are transparent and but slightly flexible. The crystals contain 8.4 per cent. of water of crystallization. Caffeine melts at 178°C . (252°Fahr .), and sublimes unchanged at 185°C . (365°Fahr .) It is sparingly soluble in cold water, alcohol, and ether; forms salts with acids, most of which are unstable; is employed in medicine; and is of great value as a refreshing article of diet, acting as a nervous tonic and appeasing hunger. Citrate of caffeine is a favourite remedy for headache. Caffeine has little taste, but it is bitter and grating.

CAFFEONE. A brown oil, forming the aromatic principle of coffee.

CAFFER BREAD. See ENCEPHALARTOS.

CAFFRA'RIA. See KAFFIRARIA.

CAFFRISTAN. See KAFFIRISTAN.

CAGLIARI (the Roman *Calaris*), the capital of Sardinia, and also of the province of Cagliari, is in the south part of the island, of which it is the chief port, on the Bay of Cagliari, and has a population of 33,000. It is built partly on the sea-side and partly on the slope of a steep hill, on the highest part of which is the castle, with the royal palace. The streets of the old town are narrow and irregular, but it has some pleasant promenades and suburbs. The Marina, between the hill and the shore, is a well-built quarter containing the lazaretto, arsenal, bonding warehouses, and the residences of the consuls and merchants. Cagliari is the seat of an archbishop, who is primate of the island; it is also the residence of the governor. There are a university, founded in 1596 by Philip III. of Spain, and restored in 1720, with the four faculties of theology, law, medicine, and philosophy and bells letters; several fine churches—one of which is a cathedral, completed in 1312 by the Pisans, but afterwards altered and modernized—and convents; a library of 22,000 volumes; an observatory; a theatre; a museum with good collections of minerals, birds of the island, and medals, including some of the Carthaginian period; a college, a diocesan seminary, a public grammar school, and several elementary schools. Besides these buildings there are several charitable institutions, a large custom-house, a mint, and barracks. The city is connected with most other important towns in the island by some good roads. The railway runs to Iglesias and Porto Torres—the harbour of Sassari—and from Sassari, which is the next town of importance in Sardinia to Cagliari, to Oriskani. Cagliari has also communication by telegraphic cable with Malta and the mainland. The harbour is safe, and is one of the best in the Mediterranean; large ships find good anchorage in the bay. Steamers ply regularly to Naples and other ports. Numerous vessels, particularly from Sweden and Finland, when returning home after having brought supplies of pine-wood to Spain and Italy, call here for cargoes of salt, which is procured from the extensive lagoons by which the town is surrounded. Besides this commodity the exports consist of cheese, wax, oil, lead, flax, hides, and horses. Arms, gunpowder, cotton fabrics, cake-sulphur, furniture, leather, soap, and tobacco are the manufactures. The climate is good, and an abundant water supply is now secured. There is a fertile plain extending from here to Oriskani, which is tolerably well peopled. As in Africa and Sicily, the fields are usually mowed with hedges of cactus. Cagliari, which was founded by the Carthaginians, has undergone many vicissitudes. It has been several times bombarded—once by the English in 1708, and during the French occupation of Sardinia. The King of Sardinia resided here. Roman remains are numerous; among them are an amphitheatre and an aqueduct.

CAGLIOSTRO, ALESSAN'DRO DI, commonly called *Count Cagliostro*, the celebrated impostor of

modern times, was born at Palermo in 1743. His real name was Giuseppe Balsamo, his father being a small shopkeeper of that town. He received the elements of education in the seminary of St. Roch, and afterwards became a novice at the Convent of Cartegirone, where he was made assistant to the college apothecary. In this office he picked up a little knowledge of chemistry and the use of drugs, but having been guilty of gross misconduct he was expelled the college. He then tried his hand at painting, at forging tickets for the theatres, telling fortunes, &c., until at last, being detected in an act of swindling, and fearing the vengeance of the man he had robbed, he fled to Rome. Here he married a beautiful young woman, and assuming the title of count set off with her on a swindling tour throughout Europe. At different times he assumed the character of physician, philosopher, alchemist, fortune-teller, predictor of lucky lottery numbers, and grand coptha of Egyptian freemasonry. Among other deceptions he pretended to be able to restore the aged to youth, declared himself to be 150 years old, and his wife, to aid the scheme, used to declare she was sixty, and had a son who was a commander in the Dutch navy. He succeeded in duping people in most of the chief towns of Italy, Saxony, and Eastern Germany, but was detected at St. Petersburg, and ordered to quit Russia. He was again detected at Warsaw in 1780; but in 1783 he visited Strasbourg, where he made the acquaintance and secured the confidence of Cardinal Duke de Rohan. He was implicated in the affair of the Diamond Necklace, and was committed to the Bastille, but succeeded in obtaining acquittal, and in 1786 came to England, where he remained two years. He then visited Switzerland, was subsequently driven from Turin and Trent, and at last, in 1789, passed to Rome, where he was arrested by the Inquisition. After being imprisoned for eighteen months he was tried for freemasonry, and was sentenced to imprisonment for life in the fortress of St. Leo, at which place he died in 1795.

See Carlyle's "Cagliostro," and also the "Diamond Necklace" (Miscellaneous Essays).

CAGOTS, the name given to a tribe of men somewhat resembling the Gypsies in their manners and customs, found in the Basque Provinces, Bearn, and Gascony. They have been variously regarded as the descendants of the Saracens, of the Albigenses, of cretins, and of lepers, but the most generally received opinion is that they are remnants of the Visigoths. During the middle ages they were subjected to severe laws, and were excluded from all political and nearly all social rights. They were forced to dwell apart from the rest of the community, to wear a peculiar dress, had the hardest and most repulsive work assigned them, except that they were allowed to become butchers, carpenters, and ropemakers. They were permitted to enter the churches, but only by a separate door, through which they were admitted to a portion of the building carefully marked off from the rest, and they were never allowed to partake of the mass. Their language appears to have been merely a corrupt form of that spoken around them; but their blue eyes, fair hair, and fair complexion seem to point to a Teutonic origin. At the time of the Revolution they were admitted to the rights of ordinary citizens, and they managed to destroy nearly all the manuscripts and documents relating to their families, but they are still socially regarded with aversion by their neighbours. Their hard mode of life through so many generations, and their constant intermarriages, appear to have rendered them peculiarly liable to cretinism and goitre, though perhaps the cause of the latter is hardly yet clearly established. Other tribes or communities having a similar history are to be found in Maine, Poitou, and Anjou, where they are called *Coliberts*; in Brittany, where they are termed *Caquez*; and in Auvergne, where they are designated *Marrons*. (See Michel's "Histoire des Races Maudites de la France et de l'Espagne," Paris, 1817).

CAHIR, a market-town of Tipperary, in Ireland, 9 miles W. by N. from Clonmel, and 123½ S.W. by S. from Dublin, on the railway from Limerick to Waterford, is beautifully situated on both banks of the river Suir, at the east end of a valley between the Galtees and Knockmeledown Mountains. It is a clean town, and contains some well-built modern houses. Many of the inhabitants are Quakers. The Episcopal church, Roman Catholic chapel, market-house, military barracks, session-house, and bridewell are all admirably adapted to their respective uses. Cahir Castle, of old an extensive seat of the Butlers, is in the neighbourhood, and in good preservation. It occupies the summit of an isolated rock on the left bank of the Suir, and was taken by Cromwell in 1650. The town also contains the handsome mansion which formerly belonged to the Earl of Glengall, with a park which extends along the river for 2 miles. Cahir has several flour mills, and a good trade in corn. The country round is very rich and fertile. Population, 2500. There is also a parish of the same name in county Kerry, in which is situated the town of Cahinseveen, the birthplace of Daniel O'Connell.

CAHORS, capital of the former district of Quercy and of the present department of Lot, in France, stands on a peninsula formed by the river Lot, at a distance of 358 miles S.W. from Paris, and 60 N. from Toulouse, is a very ancient place. The earliest name by which it is mentioned is *Dirona*, which is found in Ausonius. From the Cadurei, a Celtic tribe, whose capital it was, it was afterwards called *Civitas Cadurcorum*. From the name of this tribe the names Quercy and Cahors are said to be derived. The town is situated partly on a rocky eminence, and has steep, narrow, crooked streets. The houses in what is called the upper town are commonly built with terraces commanding a wide prospect. The few remarkable buildings are the ancient cathedral, part of which dates from the seventh century; the ecclesiastical seminary; the former episcopal palace, now the residence of the prefect; the theatre; the public library; and the obelisk erected to the memory of Fénelon, who studied at the college here. The principal Roman remains are the ruins of a theatre and an aqueduct. The Lot is crossed at Cahors by three bridges, one of which, the Pont Louis Philippe, replaces the old bridge of Notre Dame. The Pont Valendré, a structure of the thirteenth century, is surmounted by three high square towers, one at each end and one in the centre. The old ramparts of the town are now converted into promenades. Cahors is the seat of a bishop, whose see is the department of Lot. It has tribunals of first instance and of commerce, and a university academy, which has jurisdiction over the departments of Lot, Lot-et-Garonne, and Gers. The chief manufactures are china-ware and delf, cotton yarn, leather, paper, and glass; there is a considerable trade also in leaf tobacco, the wines of the neighbourhood (which are produced in considerable quantities), brandy, truffles, oil, cattle, and hides. The population in 1882 was 13,388.

Cahors was the scene of a severe struggle between the French and English in the twelfth century, and in 1580 it was captured by Henri of Navarre. Pope John XXII. and Marot the poet were natives of this place.

CAINOZOIC EPOCH (from Gr. *kainos*, recent; and *zoe*, life; also spelt Kainozoic, Cænozoic, or Cenozoic) is the name of the third and latest great division of past geological time. The term was proposed by Professor Phillips, and includes the periods previously classed under the Tertiary and Quaternary systems. The life provinces of the invertebrate fauna all through this epoch were similar to those of the present day, some existing forms making their appearance in the Eocene; so that although there is one great continuous series of beds, this epoch has been subdivided by Sir Charles Lyell into periods, according to the percentage of existing species of shells which they contain; thus in Eocene times from 3 to 10 per cent. of the species

of Mollusca then living still survive; in Miocene times their numbers had increased to about 30 per cent.; beds of Pliocene age contain from 50 to 90 per cent.; while in the Post-pliocene, or Recent period, they range from 95 to 100 per cent. To these four periods recent writers have added the Oligocene, which has been introduced between the Eocene and Miocene periods, it having more affinity with the latter.

The Cainozoic Epoch succeeds the Mesozoic, and although in Europe it rests unconformably on the Cretaceous rocks, indicative of a great lapse of unrecorded time, yet in some parts of North America there is a continuous series of conformable beds. In both continents, however, the fauna and flora of the new epoch are totally distinct from those of the preceding, modern types of animals and plants being introduced; true placental mammals, dicotyledons, and palms predominating, and supplanting Mesozoic forms. In the latter part of the epoch man appears and assumes the rule, not by brute force, as preceding rulers had done, but by his superior intellect; hence it has been proposed to call this portion of the epoch the Psychozoic Era, or that in which the mind reigned. Of man's first appearance on the earth we are still in doubt; no reliable evidence has been as yet procured to show the existence of the human race prior to Quaternary or Post-pliocene times in either Europe or America. In the river gravels of France his earliest relics have been discovered; and in England paleolithic flint implements have been found in what are believed to be inter-glacial strata, but by some high authorities his advent in this country is considered to have been pre-glacial. We are uncertain whether man appeared earlier; but as the cradle of the human race was probably in Asia, this uncertainty must remain until the deposits on that continent are thoroughly examined.

In the British Isles rocks of this age are only very slightly metamorphosed; they consist of soft clays, sands, and occasional pebble-beds, while towards the north of the area (Ulster and Scotland) there are thick volcanic deposits of Oligocene or Miocene age. There are two principal basins of stratified deposits; in the London basin the Eocene beds are covered by Pliocene strata, while in the Hampshire basin they are covered by Oligocene beds. Outlying patches are the BOVEY TRACT BEDS and the Pliocene clays of Lough Neagh.

On the continent of Europe this epoch is largely developed, and the beds are often highly metamorphosed. In places there are formations which rest unconformably on the Chalk, and contain an admixture of Cretaceous and Tertiary fossils. These beds are considered to be "passage beds," or beds of intermediate age; the most prominent are the Maestricht chalk on the Meuse, and a limestone at Faxoe in Denmark. In some places towards the south of Europe the epoch can only be divided into Eocene and Neogene strata, the latter division including all the Post-eocene beds.

CAIRN or **CARN**, a Celtic word signifying a heap or mound, which appears very frequently in the names of hills and mountains in Scotland, Ireland, Wales, and other Celtic districts. It is also given to heaps of stones thrown together in a conical form, and used to mark boundaries, meeting-places, as historical monuments, and also as burying-places. The practice of heaping together stones for these purposes is one of great antiquity, and there are several references to it in the Book of Genesis, in the early history of the Jews, and in that of other nations of antiquity.

There are several kinds of cairns found in Great Britain and Ireland, the simplest form being that of a conical heap of rough stones, sometimes surrounded by a ditch or one or more rings of upright stones.

The largest and most important cairns, however, are erected over stone chambers, to which one or more galleries lead. Many of these have been found and explored, the

most celebrated being that at New Gange, near Drogheda, Ireland. It has been calculated that this monument contains about 180,000 tons of stones. A gallery or tunnel leads from the outside to a large central chamber, situated nearly in the centre, of a cruciform shape, the three recesses of which contain each a large urn or basin of stone.

Many of the cairns which were used for burial-places have been found to contain, in addition to the bones of the dead inclosed in stone or earthenware coffins, flint weapons and tools, and implements of bone or bronze, together with rings, beads, and other ornaments. In districts where stones were scarce mounds of earth were used for similar purposes.

CAIRNES, PROFESSOR J. E., one of the most powerful and exact of modern political economists, was born at Drogheda in 1824. While at Trinity College, Dublin, he devoted himself to the study of political economy, and upon a vacancy there in 1856 in the professorship founded by Archbishop Whately, Mr. Cairnes was elected to occupy the chair. A small volume of lectures on the "Logical Method of Political Economy" was the first fruit of his labours, and it was afterwards selected at Cambridge as a text-book, and recommended to students in the moral sciences. In his "Essays in Political Economy, Theoretical and Applied," he came to the conclusion that the effect of the gold discoveries would be a movement in prices following a well-

defined order; and some years subsequently Professor Jevons proved statistically by actual facts the accuracy of most of Professor Cairnes' predictions. His most valuable and original contribution to economic science was a work entitled "Some Leading Principles in Political Economy," published in 1874. Professor Cairnes' analysis of the industrial organization into several non-competing groups was a valuable correction of the assumptions of economic reasoning, bringing its data into closer correspondence with the facts of experience, while the statement and investigation of the law of cost threw a flood of light on phenomena that had been hitherto obscured rather than explained by economists. In 1862 he published a most remarkable work on "The Slave Power," at that time the burning question of the day. Speaking economically, it settled the question once for all, by proving slavery the most wasteful form of labour. He was for some time professor of political economy at Queen's College, Galway, and subsequently at University College, London, but was obliged to resign the latter in 1872 through failing health. He died on the 7th of July, 1875.

CAIRN GORM, a mountain in Scotland, in the Grampian range, 4095 feet high. Besides other minerals, the topizes known as "Cairngorm stones" are found here. The same stone is also found in Cornwall, Brazil, Siberia and elsewhere.



Cairo and the Pyramids.

CAIRO (more properly *Al-Kahira*, which was its former name, but now called by the natives *Masr*, "the victorious"—the Muslim of Scripture) is the capital of modern Egypt, and is situated in 30° 2' N. lat., and 31° 15' E. long., between the eastern bank of the Nile and the ridge of Mokattam, near the apex of the delta of the Nile, 150 miles by rail from Alexandria, and 100 from Ismailia on the Suez Canal. Cairo occupies about 3 square miles. It is now completely surrounded by a wall, the gates of which are shut at night, and is commanded by a large citadel situated at a distance of the town, on one of the lower elevations of the Mokattam ridge, in which is the residence of the pasha. The defences are not, however, of any great military value. The Nile originally flowed close to the western wall of the city, but a change in the

direction of the stream, in the thirteenth century, caused by a sandbank, left a wide space of ground between the old town and the river, which is now occupied by the modern European quarter.

In the neighbourhood of Cairo are Schoobra, with a country-house and fine gardens of the pasha; and Abou Zabel, where are a school of medicine, anatomy, and surgery, and a large military hospital, all established by Mehemet Ali. Nearly opposite Cairo, on the left bank of the Nile, are the great pyramids of Ghizeh.

Cairo still maintains the reputation of being the best school of Arabic literature; and for Mohammedan theology and jurisprudence the fame of its professors remains unrivalled. In the university attached to the Mosque Al Azhar free instruction is given to about 7000 students.

The city of Cairo is the seat of government and the residence of the viceroy, being also on the railway from Alexandria to Suez. The population, including the suburbs of Boulak and Fostat or Old Cairo, is estimated at 350,000, comprising Mohammedans, Copts, Jews, and numerous foreigners, of whom about 20,000 are Europeans. The climate is considered healthy in the winter months, when the thermometer seldom falls below 40° Fahr., or rises above 70°; but damp, unwholesome exhalations prevail after the July rising of the Nile has subsided; and the heat in August, reaching an average of 86°, is rather oppressive for Europeans. Owing to the overcrowding of the natives, many of whom come into the city to die within its boundaries, the death-rate is higher than in any European capital.

Beside the viceroy's palace the citadel contains the arsenal, mint, public offices, and the magnificent alabaster mosque of Mehemet Ali. The citadel itself is commanded by forts placed on the extremity of the chain of Mokattam, on the slopes of which Cairo is built.

A series of gardens and plantations separate the city proper from its suburbs—Boulak and Misr el Aatiki. Cairo is divided into several distinct quarters, according to the religion and race of its inhabitants, as the Coptic quarter, the Jews' quarter, and the Frank or foreigners' quarter—all of which are separated by gates. Shepherd's Hotel, a large and well-conducted establishment, is the great resort of the English.

The edifices of Cairo comprise many of the finest remains of Arabian architecture, all dating from the reign of the Arabs and the ancient sultans of Egypt. Among them are about 100 mosques, with picturesque minarets, several of the ancient gates, an aqueduct for conveying water from the Nile to the citadel, the ancient works of the citadel itself, and the palace and well of Joseph. At Old Cairo are the seven towers, still called the Granary of Joseph, and serving their ancient purpose. In the island of Rhoda is the celebrated Nilometer, a graduated column for indicating the height of the water during the annual inundation of the river; on the south of the city, outside the walls, are the tombs of the Mamelukes who were inveigled into the city by Mehemet Ali and indiscriminately massacred; and on the north-east the celebrated obelisk of Heliopolis, which is the oldest in the world, having been erected about a century before the arrival of Joseph in Egypt. Cairo is traversed by a canal for irrigation, which commences at Old Cairo. There is a branch railway of a mile in length to Boulak, the port of the city, and telegraphic lines connect it with Alexandria, Suez, and Damietta.

Cairo was long the chief entrepôt for the commerce of Egypt, and its trade greatly increased after the opening of the railway to Alexandria and Suez. The bazars are well supplied with goods of every description, and thronged with crowds of visitors of all nations; caravans arrive annually from Mourzook, Sennaar, and Darfur. Besides the transit trade in gum, ivory, indigo, sheep, &c., manufactures of cotton, paper, saltpetre, silk, and leather are carried on; and European goods, such as machinery, cutlery, and hardware, are imported. There are four primary government schools, excellent schools conducted by the American and other missionaries, who also preach in Arabic; a museum of Egyptian antiquities, a magnetic observatory, hospitals, and a lunatic asylum. Miss Whately's schools may be mentioned as specially interesting to our own countrymen. An elegant Gothic church for the English Protestant residents was opened in Cairo in 1876. In addition to these buildings there are the opera-house, situated in the principal square—now converted into public gardens, with a lake in the centre—the theatre, and hippodrome. Cairo has been greatly improved in accordance with European ideas. New streets have been constructed, the chief of which—the Boulevard Mehemet Ali—traverses the city from the Ezbekeeyah, the principal square, to the citadel. Ismaili-

yeh, a new quarter in the direction of Boulak, is now almost entirely built upon, many of the erections being fine villas with gardens attached. Gas is used in the most important thoroughfares, and water is supplied to many houses by a company. An iron bridge has been constructed across the Nile. Notwithstanding all these marks of modern progress in many parts, the city still retains its Oriental appearance. Several newspapers are published here in Turkish, Arabic, and European.

The open spaces are few, and the greater number of the streets are so narrow that two laden camels can scarcely pass abreast, and in many there is hardly room for one. This arrangement excludes, as it was intended, the rays of the sun, and places the thoroughfares in shadow. In the cool of the evening the crowd is incessant, the variety of costumes striking, and the street cries are deafening and discordant.

Cairo was founded by the Arabs in 970; its citadel was built by Saladin in 1176; and it was the capital of the sultans of Egypt till the time of the Turkish conquest in 1507; since which it has been the residence of the pachas, governors of the province. It was taken by the French in 1798, after the celebrated "battle of the Pyramids," fought outside the walls, and held by them for three and a half years, after which it was easily recaptured by the combined English and Turkish forces. The city was also occupied by the British forces, after the battle of Tel el Kebir, in the autumn of 1882, at the close of the campaign against Arabi Pasha. The name of Babylon, or Babylon of Egypt, is frequently used in the writings of the middle ages to denote Cairo.

CAISSON, in civil engineering, is the name given to a chamber or large case constructed of timber or iron, used for planting foundations under water. In those cases where a bridge is intended to rest upon large cylindrical iron columns, these are made to act as their own caissons, and by means of pressure on the top, they are caused to sink in the ground, the soil being excavated as they go down. At other times caissons sink to the bottom of the water are used as foundations, the weight of the masonry causing them to sink in the ground; the workmen also excavating from below by means of an air chamber, which is eventually filled up with masonry or concrete. Another form of caisson is that which is used merely to keep the water away from the workmen while the masonry is being erected within it, and which is removed when the pier is finished.

In military affairs tumbrils or ammunition wagons are termed caissons, and the same name is also given to a strong wooden case made to hold powder for the purpose of mining, fortifications, &c.

In connection with shipping, a caisson is a large floating air chamber used for lifting a vessel out of water for repairs or inspection. For this purpose it is sunk alongside or under the vessel to be raised, and being made fast the water is pumped out, and it rises, bringing the vessel with it. Vessels that have been wrecked near a flat shore are sometimes raised by means of caissons. These are attached at the time of low tide, and they rise with the hull, so that the whole floats at high water, when they can be towed or pushed near the shore or into whatever harbour is most convenient.

CAITHNESS (in Old Norse called *Katanes*), a county which occupies the north-eastern extremity of Scotland. It is bounded on the west by Sutherlandshire; on every other side it is washed by the ocean. The extreme length of Caithness, by a line drawn from its south-west point to Duncaulby Head, is 43 miles; the greatest breadth, from E. to W., is about 30 miles. The total area is 712 square miles, or 155,808 acres; and the population in 1881 was 38,865. The circuit of the county is about 150 miles, of which 100 are coast. The nearest of the Orkney Islands is about 10 miles distant.

The navigation of the Pentland Frith is somewhat dangerous, from the strength of the currents and breakers or reefs. On the north side of Stroma there is a small vortex or whirlpool, named Swalechie, and nearer the mainland there are breakers, called the Merry Men of Mey. The Stalks of Duncansby are two insulated columns of freestone, detached from the cliff, of which they originally formed a part; they are inhabited during the summer by thousands of aquatic birds. What is termed John o' Groat's House is a piece of green turf on the east side of Duncansby Head, on which it is possible a house may have stood, but there has been no trace of it for many years.

The coast-line presents numerous indentations and bays, the principal of which are the harbours of Thurso and Wick. On the north, where Caithness is separated from the Orkneys by the Pentland Frith, the projections on the coast form two bold precipitous headlands; the one on the north-east, called Duncansby Head ($58^{\circ} 37' N.$ lat., $3^{\circ} 1' W.$ lon.), and the other on the north-west, called Dunnet Head (in $58^{\circ} 40' N.$ lat.), the most northern point of the mainland of Great Britain.

The coast-line generally presents great attractions to the tourist, being often very magnificent, and distinguished by bold cliffs with picturesque, detached pillars of sandstone rocks variously worn by the waves. The interior of Caithness has few features of interest, for, with the exception of a limestone ridge, along the Sutherland border, terminating in the vast granite precipices of Old Ness, and rising 2324 feet high at Morven, the country is a bleak undulating plain of moss and moor, on a bottom of Old Red Sandstone. Peat is very abundant, and there are quarries of flagstone, freestone, and slate. The county is watered by the rivers Thurso, Wick, and other small streams, and by Lochs Watten, Stenston, and Hempriggs. Owing to its being nearly surrounded by the sea, the winters are less severe than might be expected, but the summers are generally cold and wet. Only 196,000 acres—about 24 per cent. of the entire area—are under cultivation. The principal crops in 1883 were—oats, 34,000 acres; barley, 1500; turnips and swedes, 14,000; potatoes, 2000; clover, &c., 27,000; and permanent pasture, meadow, or grass, 25,000 acres. The climate is too wet for wheat. The parts of the surface under tillage on the slopes and level tracts of the high plains, and along the streams, are generally a deep loam on a strong till clay. In the north-east the soil is sandy. The crops are twenty days later than in the south of Scotland. The live stock in the county, according to the returns published in 1883, consisted of 20,000 head of cattle, 90,000 sheep, and 1500 pigs. The estates are large and entitled; the farms small and held yearly. Argyll and Skye cattle and Cheviot sheep have been introduced to improve the native breeds, with success. The farm buildings and the system of agriculture and condition of the roads have been very much improved in recent years. Many of the small farmers occupy much of their time in fishing—the herring fishery on the coast employing, in July and August, about 2000 boats and 12,000 persons; but about 5000 boats are from other parts of Scotland. As many as 150,000 barrels of cured fish have been exported from Wick in a single year. There are also ling, cod, salmon, and lobster fisheries. The other exports from the county are cattle, oats, and wool. The only article of manufacture consists of woollen cloth.

Caithness, which gives the title of earl to the head of the Sinclair family, returns one member to Parliament, the number of voters in 1881 being 1200. The chief towns are Wick and Thurso, connected by a line of railway, opened in 1873, which communicates with the main system of Scotland. The peninsular portion of the county north of the Moray Frith and Ockel River was formerly called the Kaith, perhaps from an old Celtic word *Kithe*, end or extremity, there being traces of an old Celtic name here,

as in South Wales and south-west of Ireland. This county formed the promontory of the Kaith. It was the seat of the *Catani*, in the Roman province of Vespasiana, and was afterwards settled in by the Scandinavians, from whom its present inhabitants derive their origin, as may be seen from their fair features and their height, as also from the fact that English and not Gaelic is the prevailing tongue. There are the remains of Berriedale, Girnigo, Wick, Acker-gill, Barrogill, and eleven or twelve other castles around the coast, besides Pictish forts and Druid circles. The weights and measures of Caithness were fixed upon by David II. as the standard for all Scotland.

CAIUS COLLEGE, Cambridge (pronounced *Keys College*), or more properly Gonville and Caius College, was founded in 1318 by Edmund de Gonville, rector of Terrington and Rushworth, Norfolk, who, however, died before his intentions were completed, and they were carried into effect by William Bateman, bishop of Norwich. Various other benefactors added to its endowments, especially Dr. Perse, who founded six fellowships, and gave to the college the right of appointing the master of the free school, which he had established at Cambridge.

In 1557 Dr. John Caius, having rebuilt a large part of the college, erected the chapel, and endowed three additional fellowships and twenty scholarships, obtained from Queen Mary have to be a co-founder, and to change the name from Gonville Hall to Gonville and Caius College.

New statutes were given to the college under the provisions of the Act 19 & 20 Vict. c. 88, by which it was thereafter to consist of a master, thirty fellows, and thirty-six scholars. Twelve of the fellows are seniors, and the other eighteen juniors. They are generally chosen from graduates of the college. The fellowships are all open, and not vacated by marriage, but terminate in general at the end of ten years from the full standing of M.A. The scholarships are divided into classes—nine of £60, nine of £40, six of £30, and twelve of £20. They are all perfectly open. There are also four Tancred studentships (founded by Christopher Tancred, Esq.), each of the annual value of £100, and two Harrow scholarships connected with this college. See the next article.

CAIUS, DR. JOHN, was born in 1510. His real name was Kaye or Key, which he Latinized to Caius. He was sent to Gonville Hall, in the University of Cambridge, where he took the degrees of B.A. and M.A., and was chosen fellow of his college in 1533. In 1547 he became a fellow of the College of Physicians, of which he was president for more than seven years. Having obtained permission from Queen Mary to advance Gonville Hall into a college, which still bears his name, he accepted the mastership of the college, and passed the last years of his life in it. He died in 1573, in the sixty-third year of his age. The most interesting of his works is his treatise on the sweating sickness. The epidemic described by him was that of 1551, the fifth and last of the kind. It was an intense fever, of which the crisis consisted in a profuse perspiration. The writings of Dr. Caius are exceedingly numerous, and display his talents as a critic, a linguist, a naturalist, and an antiquary, as well as a physician. See the previous article.

CAJANUS is a genus of plants yielding the pigeon pea, Congo pea, or no-eye pea. It is uncertain what is its native country, but De Candolle inclines to the opinion that it grows truly wild only in tropical Africa, and was introduced into Asia by traders from Zanzibar to India. There is not much doubt that it was brought into America with negroes from Africa, and its botanical name is taken from the African designation—*Cajan*. It is cultivated extensively in all tropical countries. C. Kingsley, in "At Last," speaks of the plant thus:—"The young laburnums (as they seem), with purple flowers, are pigeon peas, right good to eat." In some countries the peas are liked better when the plants are cultivated as annuals. Macfadyen,

in his "Flora of Jamaica," says, "No particular care or trouble is required in the cultivation of these shrubs, and they thrive in the poorest land. They are said, indeed, to improve the soil on which they grow by the decay of the leaves, which are annually shed in great profusion. There are few tropical plants, indeed, so valuable. They are to be found around every cottage in the island, growing luxuriantly in the parched savannah and mountain declivity, as well as the more fertile and seasonable districts."

There is only one species, *Cajanus indicus*, though some botanists have thought that the two varieties, *bicolor* and *flavus*, should rank as species. In the former, the pigeon or Congo pea, the calyx has brownish purple markings and the corolla orange-coloured stains. The no-eye pea is much the more delicate, and hardly inferior to our cultivated peas.

The pod is compressed, acuminate, marked distinctly between the seeds by oblique depressed lines. The leaf is composed of three leaflets.

CAJUPUT or CAJEPUT OIL is a product of a small tree, *Melaleuca minor*, otherwise *Melaleuca cajuputi*, which belongs to the Myrtle family, MYRTACEÆ. It is a native of Amboyna and other East India islands. The oil is obtained by distillation of the leaves, which are collected the night before they are subjected to this process. It is very limpid, pellucid, and of a light or yellowish-green colour, with a strong smell and taste of camphor. In its action on the human frame cajuput oil participates in the properties of other volatile oils, and is rubefacient externally, stimulant and antispasmodic when taken internally. It is highly esteemed by the natives, and is very useful in cases of hysteria and low fevers, and mixed with olive oil, for external use in neuralgia and rheumatism.

The tree is of small stature; the leaves are 3 or 4 inches long, lance-shaped, with parallel veins, and, as in many Australian plants, are placed with their edges up and down. The flowers are small, with long, numerous stamens, and are arranged without stalks along terminal branchlets.

Many species of *Melaleuca* are grown in hothouses for the beauty of the clustered flowers and the peculiarity of the foliage. Loam, peat, and sand, mixed in equal proportions, form a good bed for these plants.

CAKING-COALS soften and coal-sce when heated, emitting jets of gas, and burning with a bright flame; they are usually free from much ash, and are in general use for household purposes.

CAL'ABA TREE. See CALOPHYLLUM.

CALABAI', a maritime district on the west coast of Africa, bordering on the Bight of Biafra. It has no well-defined boundaries, but the coast-line may be said to stretch from the Nun mouth of the Niger to the region of the Cameroon Mountains, embracing various deltas of that river, as well as the estuary, 10 miles in width, of the Old Calabar and the Qua. The limits inland are very uncertain. The surface of the country is low and the climate unhealthy, but towards the interior the elevation increases, and the soil yields many natural productions, which supply articles for export. The chief of these are palm oil and palm kernels, and the minor ones ebony, barwood, ivory, india-rubber, sugar, and Indian corn. The Cross River, which flows into the head of the Old Calabar estuary, obtained its name from being supposed to be one of the mouths of the Quorra. It is now known to be an independent stream, and is navigable for vessels nearly as far as 200 miles from its mouth. Aconoo, Coono, and Omuu are the principal towns on the banks of Cross River, while Creek Town and Duke Town are situated on the Old Calabar. The country is inhabited by various independent tribes, of which the most important is the Efik.

NEW CALABAR (called *Rio-Real* by the Portuguese) is a river which enters the Bight of Biafra by the same estuary

as the Bonny. The town of New Calabar stands on an island in the river. There are several interesting missionary stations in the vicinity, and in recent years many converts have been made to Christianity; civilization has likewise been considerably extended.

CALABAR' BEAN, an important medicinal agent, which was first admitted into the British Pharmacopœia in 1867. It is the seed of the *Phytoligna venenosum*, a twining and half-shrubby plant of Western Africa, of the order LEGUMINOSÆ. The bean is about the size of a very large horse bean, with a firm, hard, brittle, shining integument of a brownish-red, pale-chocolate, or ash-gray colour. Within the shell is a kernel, consisting of two cotyledons, weighing on an average about 46 grains, hard, white, and pulverizable, of a taste like that of ordinary edible leguminous seeds, without bitterness, acrimony, or aromatic flavour. It yields its virtues to alcohol, and imperfectly to water. It is used in small doses internally in epilepsy, and in the treatment of strychnia poisoning; but it is very dangerous in doses of more than 4 grains, death being produced by faintness and suffocation. It is employed as an ophthalmic remedy to produce contraction of the pupils, in which it is very efficacious. In Old Calabar the beans are used by the natives as an ordeal; persons suspected of a crime are compelled to swallow them, and are considered innocent if they vomit them, guilty if they die from the effects of the poison.

The plant is characterized by the large scar (*hilum*) of the bean, and also by the style, which is twisted into a spiral with a remarkable beaked appendage at the end, below which the style is densely hairy. The bean is from 1 to 1½ inch long.

CAL'ABASH, a name given in the West Indies to the fruit of the tree called *Crescentia cujute* by botanists. It is of a gourd-like character, and sometimes a foot in diameter. The hard shell is much used in place of bottles for holding liquids, and for goblets, cups, and water cans. They may even be used for boiling liquids, and will bear it several times without being destroyed. See CRESIDENTIA.

CALABRIA, the southern part of the kingdom of Italy, and formerly one of the four provinces of the continental portion of the kingdom of Naples, consists of two peninsulas of very nearly equal length, joined by a narrow neck only 14 miles broad, between the Gulfs of Squillace and Sant'Eufemia. The area is about 7000 English square miles.

The Apennines run through the whole length of Calabria, forming large and irregular masses, with numerous offsets towards both seas, and occupying the greater part of the surface. The Calabrian Apennines are chiefly of limestone, but there are also tracts occupied by primitive rocks. A granite ridge passes through the country, and rises to the height of several thousand feet, the summits of which are clad with forests of pine, oak, and beech. Between the various masses and offsets are some extensive valleys along the banks of the principal rivers, which terminate in plains near the sea. Earthquakes and severe storms are frequent. Great heat prevails during the summer, when many of the well-to-do classes repair with their flocks to the lofty region of La Sita, from the timber of which district the ancient navies were constructed. Agriculture is backward, but the soil is very fertile. The olive, the vine, the mulberry, and the orange and lemon tree grow luxuriantly. Calabria produces a variety of good wines. Silk and oil are the staple productions of the country. Manna is gathered in small quantities in several districts. The cotton plant is also cultivated, and the sugar cane has been tried and found to succeed. There are extensive fisheries of tunny and anchovy on the coast. The Calabrian horses are celebrated for their high spirit and beauty.

Calabria is now divided into three provinces—Cosenza, Reggio, and Catanzaro, which are known also as Calabria Citeriore, Calabria Ulteriore Prima, and Calabria Ulteriore

Seconda respectively. The population in 1883 amounted to about 1,110,000.

The name Calabria was applied by the Romans to the south-eastern extremity of Italy, the modern Terra di Otranto, and does not at all correspond with the present territory. The country was chiefly occupied by the *Bruttii* or *Bruttii*. The east coast was early colonized by Greeks, and became known, with the rest of the coast as far as Tarentum, by the general denomination of Megale Hëllas, or Magna Græcia. Many of the present inhabitants are of Greek descent. The first Norman conquerors took the titles of Dukes of Apulia and Calabria. Under the Angevins the presumptive heir to the throne was styled Duke of Calabria. Calabria made a determined resistance against the French, first in 1799, when the Calabrians under Cardinal Ruffo reconquered the kingdom, and afterwards in 1806-7, when they waged a partisan warfare against the invaders. They were not ultimately subdued till 1810.

CALADIUM, a genus of plants belonging to the order ARIOFLACÆ. Several of the species of this genus are frequently cultivated in this country for the sake of their spotted stems and neat green leaves, which are rarely disfigured by any of the accidents which affect other stove plants. They resemble the species of Aium in general appearance, and also in physical and chemical properties. They are natives of tropical America.

The leaves of Caladium are annual, appearing at the same time with the flowers, cordate or sagittate, with long stalks. The ovaries are generally two-celled, and cohere slightly at the apex. The ovaries are numerous, and fixed to the septum.

CALAHORRA, a town in the province of Logroño in Spain, stands on the Cidacos, near its junction with the Ebro, in 42° 15' N. lat., 2° 1' W. long., and has a population of about 7000. It is a very old looking place, and has long been going to decay. It contains a *plaza* or square, a cathedral, some distilleries, tanyards, oil and flour mills, a foundry hospital, and an asylum for old labouring men. The environs are very fertile, but they and the town are often denuded by the inundations of the rivers. Calahorra is the ancient *Calogurris Neria*. The town was taken in 70 *na*, by Aframs, after a most desperate resistance by the inhabitants, who had to endure the horrors of a faithful defence. On the Roman town some towers and an aqueduct still remain. It was the birthplace of Quintilian, and Pudentius, the Christian poet.

CALAIS, a fortress of the first class and a seaport town in the department of Pas-de-Calais in France, stands on the eastern shore of the English Channel, at a distance of 26 miles from Dover, 20 from Boulogne, and 181 from Paris by the Paris and Boulogne Railway. In 1883 it had 149,000 inhabitants, and the flourishing suburb of St. Pierre les Calais 33,000, many of whom are English. Since 1883 the two towns have been united as one municipality, under the name of Calais. The union raised Calais to the position of the largest town in the department.

In the ninth century Calais was a mere fishing village. Bruce, IV., count of Flanders, improved the harbour in 1397, and built two strong towers for its defence. In 1221 Philippe le Bel enclosed the town with a solid wall, which still remains, and with deep ditches on the land side. In 1227 he erected the Castle of Calais, which was demolished in 1569, and replaced by the citadel that still remains and defines the place. After the battle of Crecy, Edward III. invested the town on the 1st of August, 1346. The firm resistance of the townsmen, who were suffering all the horrors of famine, the astutely conduct of the French king, who thought at the head of 60,000 men, feared to attack the English position, the cruel terms imposed by Edward, the noble self-sacrifice of Eustache St. Pierre and his companions, and the generous and successful intervention of Queen Philippa, are well known. The king

made his entry into Calais on the 29th of August, 1347, expelled all the inhabitants, reoccupied the town with English, and sent the garrison prisoners to England. The English improved the town and added to its defences; they held it till 1558, when the Duc de Guise took it by storm after a siege of seven days, and drove all the English from the town. It was the last relic of the French possessions of the Plantagenets, which at one period comprehended half the kingdom. The Spaniards held possession of it from 1595 to 1598. Charles II. resided here for some time, and James II. arrived here with a French army, intending to invade England but for the destruction of the fleet. In 1883 the old or inner fortifications were demolished, and the deep encircling fosses, with their fetid waters, filled up.

Calais is girt by the sea on the north and west, and on the south and east by low marsh land, which can be flooded except for a space of about 250 yards, and this point of approach is rendered inaccessible by the fire from the forts. The harbour is formed by two moles three quarters of a mile long; it admits vessels of 400 to 500 tons. Calais has regular steam communication with Dover, Ramsgate, and London, and is also connected with Dover by submarine cable. The centre of the town is occupied by the Place d'Armes, a spacious square serving for a market-place, and containing the Hotel de Ville, in front of which are statues of Eustache St. Pierre, the Duc de Guise, and Cardinal Richelieu. A tower 121 feet high, which stands in the Place d'Armes, formerly served as a landmark by day and a lighthouse by night. A new lighthouse has recently been erected, 190 feet in height. The cathedral is a handsome Gothic building, containing eleven side chapels, and a picture of the "Assumption," by Vandyke. The other remarkable buildings are the Hotel de Guise, in which Henry VIII. once lodged, built originally as a hall for the English wool merchants, but afterwards bestowed on the Duc de Guise for his gallantry, and now used as a museum; the public library; the theatre; and the barracks.

Calais possesses a tribunal and chamber of commerce, and schools of design, hydrography, and artillery; it has some foreign and a brisk coasting trade. Wine, oil, brandy, eggs (of which 60,000,000 are annually sent to England), and poultry, are the chief articles of export. The imports are—colonial produce, cotton, wool, iron, coal, and timber. The town has communication by canals with Arras, Dunkerque, Gravelines, and St. Omer. Calais is becoming a manufacturing town. The principal fabric is bobbinet or tulle, introduced from Nottingham by the English in 1818, and which now employs 10,000 hands. Other articles of manufacture are soap, straw bonnets, and leather. There are also steam flour and oil mills, salt and sugar refineries, and yards for boat and ship building. The imports are now valued at about £1,600,000 annually, and the exports at £1,800,000. The trade of the port is steadily on the increase. Fishing forms an extensive branch of industry, even the coasts of Iceland and Scotland being visited by the hardy fishermen.

Calais is generally pretty well built, the houses being of brick, and the streets straight, well paved, and regular. The ramparts form agreeable promenades. It derives its chief importance from being the nearest port to England, and the station for the arrival and departure of the mails between the two countries. A sum of £600,000 was voted by the National Assembly in 1875 for harbour improvements at Calais, and new sluices and other works were constructed.

CALAMANDER WOOD is the produce of one of the ebony trees (*Diospyros quersita*). It is a very beautiful cabinet wood, resembling rosewood, but harder and more durable. The tree is a native of Ceylon, and the Cinghalese use the wood in ornamental work. *Diospyros quersita* is a large tree with alternate leaves. The corolla is hairy, and in the bud contorted. In the male flowers the

calyx is very shortly lobed; the stamens are sixteen, without hairs. In the female flowers the ovary is hairy, and the albumen of the seed is not ruminated. Calamander wood is also supplied from *Diospyros oppositifolia*, also a native of Ceylon. It has the leaves opposite, and rounded at the base. The calyx and corolla are four-lobed. The male flowers have eight unequal stamens, and the albumen of the seed is ruminated.

CALAMARY. See SQUID.

CALAMBAC. See AQUILARIA.

CALAMINE (from Lat. *calamus*, a reed) is one of the principal ores of zinc, and is the carbonate of that metal ($ZnCO_3$). It crystallizes in the hexagonal system, but is most usually found massive, botryoidal, or stalactitic. In colour it varies from an impure milk-white to green or brown. It is brittle, has a hardness of 5, and specific gravity of about 4.4. Its effervescence with acids and zinc reactions are distinctive characteristics. This mineral is not to be confounded with electric calamine, a hydrous silicate of zinc described under HEMIMORPHITE.

Calamine occurs both in beds and veins, often associated with other ores of zinc, lead, copper and iron in many places in the British Isles. In Scotland it is found at Leadhills. Formerly all the zinc, or spelter of commerce, was obtained from it; now other ores are also used. To extract the metal the calamine is first crushed and calcined to expel carbonic acid; the calcined ore and some substance yielding carbon are then heated, either in an earthen retort, as in Silesia, or in a closed crucible with an exit tube at the bottom, which is the English method; the ore becomes reduced, and metallic zinc, being volatile at a red heat, distills off, and is condensed in a vessel placed to receive it. When the ore contains cadmium also this metal, being more volatile than the zinc, comes over first.

CALAMINTHA is a genus of plants belonging to the order LABIATÆ. The calaminths are herbaceous, aromatic herbs, much thought of by the older herbalists for their medicinal virtues. *Calamintha acinos* is the Basil Thyme (Greek, *basilicon*, royal), so called, according to Parkinson, "because the smell thereof is so excellent that it is fit for a king's house." Gerarde says that "it cureth them that are bitten of serpents; being burned or stewed, it drives serpents away; it takes away black and blew spots that come by blows or by beatings, making the skinn faire and white; but for such things, saith Galen, it is better to be laid to greene than dry." *Calamintha clinopodium* is the wild Basil. It is not as agreeable in odour as Basil Thyme. The flowers are in dense, branched, axillary clusters, whereas in Basil Thyme they are in whorls of six simple separate peduncles. In the other English species the flowers are in whorls of two forked cymes; these rarer species are *Calamintha nepeta*, *Calamintha officinalis*, and *Calamintha sylvestris*.

There are forty species in the genus, natives of the north temperate zone. The calyx is two-lipped, with thirteen nerves; the posterior lip of the corolla flat or slightly concave; the stamens four, didynamous; and nucules smooth. See BASIL.

CALAMITES are fossil plants which approach in their structure the modern *Equisetum*, or "horsetails." They were, however, of greater bulk, equalling *Equisetum giganteum* of South America in height, about 36 feet, but having a much greater diameter—1 foot, as compared with 1 inch in the *Equisetum*. They are frequently found in coal, and evidently grew in great masses, like the horsetails, on sandy or muddy flats. As the young calamite grew the axis became hollow, and wedges of fibro-vascular tissue were formed with the broad part towards the circumference. The interior was filled up with mud and sand. The vegetable portion sometimes altogether decayed, leaving a hard stony cast with flutings on the surface marking the position of the wedges; at other times a thin covering of coaly

matter on the cast is all that remains of the calamite. The fruit differs from that of the horsetail in having a whorl of leaves between each whorl of sporangioophores. Calamites had no sheath at the joints. These fossils are found principally in the Coal measures, but also in the Devonian and Permian formations.

CALAMUS, the genus of PALMS whose different species constitute the rattan canes of commerce. There are about 200 species, of which a few are Australian and African; but they are principally found in the hotter parts of the East Indies, where they grow in the forests, climbing over trees and bushes to a greater extent than any other known plants. The stem of *Calamus rotang* is described as being 100 feet long, that of *Calamus oblongus* 300 to 400, of *Calamus radicans* upwards of 500, and of *Calamus extensus* as much as 600 feet; Rumphius even states that one kind attains the extraordinary length of 1200 feet. It is closely covered over by the tubular bases of the leaves, through which it is drawn by the cane-gatherers when green; afterwards it is dried in the sun, and then is ready for market. From 3,000,000 to 4,000,000 of these canes are imported into this country annually. They are extensively used for the sake of the hard flinty coating of their stems, which are readily split into strips, from which the bottoms of chairs and similar articles are manufactured. It is not possible to say from what particular species the canes of the shops are obtained, it being probable that many are gathered indiscriminately; *Calamus rotang* has, however, been said to furnish the stouter, and *Calamus scipionum* the slenderer sorts. The flesh that surrounds the seeds of this genus is a delicate article of food, and the young shoots of some of them, while still tender, are roasted or boiled, chopped small, and, being fried with pepper and gravy, are said to furnish a very delicate dish. The greater part of the DRAGON'S BLOOD now met with in commerce is obtained from several species of this genus. The stems are smooth, but the other parts of the plant are armed with hooked prickles to aid it in climbing. The spathe is numerous, persistent, sheathing the branches of the spadix. The flowers are small, greenish, in two rows, one or two together among the bracts, of which one is often abortive or of a distinct sex. The ovary is imperfectly three-celled, with terminal stigmas. There are three erect ovules. The fruit is generally one-seeded, and covered with overlapping scales. See ACORUS.

CALANDRA. See CORN WHEAT.

CALATAFIMI, a town of Sicily, in the province of Trapani, in the N.W. of the island, is a badly built place with a ruined castle. It is in the midst of a fertile district, contains 9000 inhabitants, and is remarkable as having been the scene of Garibaldi's first victory in Sicily over the Neapolitans, on the 15th May, 1860.

CALATRAVA, on the south bank of the Guadiana, 21 miles from Toledo, known as the *Oratum* or *Oria* of the Romans, was in the middle ages a frontier fortress between Castile and the Moors of Andalusia. It is now reduced to a single tower, with the appellation of Calatrava la Vieja, to distinguish it from Calatrava la Nueva, which is 10 miles from it. In 1158 Sancho II. took Calatrava la Vieja, and gave it to the Templars, who, unable to prevent its reconquest by the Moors, returned it to the king. King Sancho then granted the place to the Cistercian abbot Raymond, who, with his devoted monks, not only rescued Calatrava from danger but began to make excursions against its assailants. Raymond in the same year, 1158, founded the military order of Calatrava, under the rule of St. Benedict, and united it to the Cistercian. The Knights of Calatrava at first wore the Cistercian habit, but they afterwards adopted a secular dress. In 1185 Ferdinand and Isabella united the grand-mastership of Calatrava to the crown. This order was distinguished by the title of "the gallant order."

CALCAIRE GROSSIER is the coarse Tertiary limestone, of a pale yellowish colour, that is much used in Paris as a building stone. When first quarried it is very soft, but it hardens on exposure. The beds in which it occurs are believed to be contemporaneous with the BRACKENSHAM BEDS. Of other beds of the Paris Tertiary basin, the *Grès de Beauchamp* and *Calcaire marin* are considered equivalent to the Headon and Osborne series; while the *Calcaire lacustre* and *Calcaire siliceux* are correlated with the Bembridge series of the Isle of Wight. The *Calcaire de la Beauce* is probably equivalent to the Hempstead beds, and of either Oligocene or Miocene age.

CALCAREOUS ROCKS are composed in some cases almost entirely of pure carbonate of lime, or carbonate of lime and magnesia; at other times the lime only forms an important constituent. This group of rocks is not only a very numerous one, but commercially it is most important, as from it we are supplied with numerous excellent ornamental and building stones, and the chief ingredient for building cements, besides material valuable for agricultural purposes.

The members of the group are chiefly of either organic or chemical origin, but are sometimes derivative or of sedimentary origin, and are found in every geological age, from the Laurentian of Canada to the most recent accumulations of coral reefs.

Limestone is composed of carbonate of lime in various degrees of purity; it may be massive and earthy, or highly crystalline, passing into marble; it usually contains numerous fragments of corals, shells, and similar organic remains; in colour it varies greatly; the black and dark coloured varieties contain carbonaceous matter, the red are coloured by iron. The Bala limestone is the earliest important band of limestone in the British area. The calcareous formations of Carboniferous age are of a great thickness; they were probably accumulated in a manner analogous to that of CORAL REEFS at the present day. The Lias limestone is largely burned for lime, and is usually hydraulic. The Oolite limestones are to a great extent composed of small spherical particles having a concentric structure; they supply a good building stone and lime. Chalk is a very pure earthy form of limestone, usually white, and largely composed of shells of Foraminifera. Marble is a metamorphosed limestone; it has a highly crystalline texture, the organic remains being generally obliterated. Magnesian limestone, or dolomite, contains a certain proportion of carbonate of magnesia. Mail is a clayey or earthy deposit containing a large proportion of carbonate of lime, often as shell fragments; it is usually of sedimentary origin, and derived from chalk or limestone rocks.

When limestone (CaCO_3) is burned, carbonic acid (CO_2) is expelled and quicklime is formed (CaO). Hydrated limestones contain a certain proportion of clay or siliceous matter; they form a cement or mortar that hardens or "sets" in water.

Travertine, or *calcareous tufa*, is of chemical origin; it is deposited from waters highly charged with carbonate of lime (see CALCAREOUS SPRINGS), and often forms thick beds in the vicinity of lime-bearing rocks. It makes a good building stone, and hardens on exposure; the temple of Paestum, and St. Peter's at Rome, are built of it. A cellular, light, and resisting variety was much used in the vaulted roofs of the great churches and other buildings in Ireland. The name is from Tiburtine or Tiber stone, from its abundance there.

Stalactites are long masses of carbonate of lime hanging from the roofs of caves. They have been deposited from calcareous water, which, dripping through the roof, evaporates till a supersaturated solution is formed, when the calcareous matter deposits, successive accretions taking place downwards.

Stalagmites form in a similar manner on the floor of the

cavern, where the drop falls; they grow upward, often uniting with the stalactites to produce pillars, columns, and other figures.

CALCAREOUS SPRINGS contain carbonate of lime in solution, owing to the solvent power of the carbonic acid (CO_2) in the water. This carbonate of lime is deposited about the spring, and along the course of its waters, as Travertine or calcareous tufa, on account of the escape of the carbonic acid and evaporation of the water. Although carbonate of lime is not soluble in pure water, yet in waters containing dissolved carbonic acid it is readily soluble, and the more highly charged the waters are with this acid the greater is their solvent power. As this substance exists in the atmosphere, all rain-water contains some, and the quantity is increased when the rain reaches the earth, from decomposing organic matter, &c. These waters are therefore powerful solvents of limestone, and as they percolate through the rocks, and the pressure on them becomes greater, they are capable of dissolving more carbonic acid, and therefore more carbonate of lime. When these waters issue as springs at the surface of the earth, the pressure being released, the carbonic acid escapes (sometimes with ebullition), and consequently the carbonate of lime is deposited; this deposit is cellular when the waters are much agitated, but is dense and compact from quiet waters, and though usually white it is sometimes coloured by salts of iron.

Calcareous springs are to be found in all districts where carbonate of lime occurs in the rocks; a noted spring is that of San Vignone, Italy, where the deposit of travertine is 250 feet thick. They are very abundant about the Yellowstone Park, North America.

CALCEOLARIA, a genus of very ornamental herbaceous or shrubby plants, belonging to the order SCROPHULARIACEÆ. Its distinctive characters are principally that the flowers have two stamens and a two-lipped corolla, the lower lip of which is much larger than the upper, and inflated so as to resemble a bag. The lower lip in a few species of the *Jovellana* section is not inflated, but resembles the upper lip.

There are 120 species, natives of Western America, principally growing on the Andes, and ranging from Magellan's Straits to Mexico; there are two species in New Zealand. In Chili and the mountainous parts of Peru they are so common as to give a peculiar appearance to the vegetation. Some of them are lowlanders; others inhabit the highest parts of the Andes in the districts just below the regions of helians and mosses; and thus, if both their wide geographical distribution and the various elevations at which they occur are taken into account, they are exposed to every kind of climate between those of England and Barbary.

The greater part of the genus has yellow flowers, a few have purple ones, and here and there in nature species occur with the two colours intermixed, by the addition of spots of purple to the yellow ground colour, the latter changing the former to a deep rich brown. By intermixing artificially the two colours natural to the genus, a production of hybrid varieties has resulted, and some crosses of extraordinary beauty have been obtained.

CALCHAS, the famous Greek soothsayer of Mycenæ, whose counsels directed the Grecian host before Troy. He foretold that the war would last ten years, and himself brought about its termination by the ever-famous stratagem of the wooden horse. In the opening scene in the *Iliad* Calchas declares the anger of Apollo to be only appeasable, and the pestilence resulting therefrom only to be stayed, by the return of the captive Chryseis. Agamemnon indeed returns her, but seizes Briseis in requital, who had fallen to Achilles' share. Hence the wrath of Achilles and the reverse of the Greeks, which form the subject of the greatest of epics.

CALCINATION. This term expresses the separation of the volatile from the more fixed parts of a body; it means burning to *calces* or ashes. Thus bones which are heated till they become black are termed *burned bones*; but when, by the further operation of heat, they become white, they are called *calcined bones*. Salts deprived by heat of their water of crystallization are also called calcined. But what were formerly termed metallic calces or calcined metals are now described as metallic oxides, as in these cases oxygen has been added to the metals and the weight invariably increased.

CALCITE, or CALC-SPAR, is crystallized carbonate of lime (CaCO_3), usually occurring as either rhombohedrons, scalenohedrons, or hexagonal prisms, but there are about 800 distinct forms; however, all are referable to the hexagonal system, and possess a distinct rhombohedral cleavage. The hardness of this mineral is the typical 3 of Mohs' scale (between gypsum and fluor spar), and the specific gravity about 2.6. When pure it is of a clear white colour, but is often coloured by foreign substances. Double refraction is strongly developed in crystals of this mineral. Of the many varieties of calcite bearing distinctive names the most important is *Iceland spar*, a pure transparent variety obtained largely in Iceland, and chiefly valuable for optical purposes, as doubly refracting and Nicol's prisms are constructed from it. *Fontainebleau limestone* is crystallized carbonate of lime, containing up to 65 per cent. of sand caught up in the crystals. Calcite enters into the composition of all calcareous and limestone rocks. A dimorphic form of carbonate of lime is *ARAGONITE*; it crystallizes in the rhombic system.

CALCIUM, a peculiar metal, of which *lime* is the well-known oxide. It was first obtained by Davy, in 1808, by the action of voltaic electricity on a small mass of chalk. It is yellowish-white, of great lustre, can be rolled into sheets and hammered leaves, and is nearly as hard as gold. Calcium when heated burns in air and in chlorine with a brilliant light; also in iodine, bromine, and sulphur. It decomposes water rapidly. It forms an amalgam with mercury. It is prepared by Mathieson's process from melted chloride of calcium by electrolysis. Many of its compounds with other elements have been long known and extensively employed. Its atomic number is 20; symbol, Ca . Its specific gravity is 1.5578.

Oxygen and calcium combine to form two compounds, the protoxide of calcium (CaO), commonly known as lime, and the peroxide of calcium (CaO_2), known only as a crystalline hydrate. Lime has been known from the remotest antiquity and is one of the most abundant and universally diffused substances in nature. It is never found pure, but always combined either with other earths or with acids. If the carbonate of lime, in the form of marble or limestone, be burned, the carbonic acid is expelled, and pure or quick lime obtained. Pure lime is best made from black marble. On the large scale the limestone is burned in kilns with coal. There are many varieties of these. The common draw kiln is used for making lime for building purposes. In this kiln the limestone, in large masses, and the coal are fed in together at the top, and the burned lime drawn out at the bottom, the working being continuous. Limestones containing silica may be used, and the ashes of the coal are also mixed with the lime so produced. For chemical purposes the finest white limestones, containing 98 to 99 per cent. of pure calcium carbonate, must be employed, and fired by coal or gas in a separate furnace. Many elaborate kilns have been invented to accomplish this. Lime is white, opaque, inodorous, acid, alkaline, and infusible. Its specific gravity varies from 2.3 to 3.08. It takes up water with great avidity. When water is sprinkled on lime it heats, cracks, swells, falls into powder, and forms *hydrate of lime*, or *slaked lime*. This property of lime has been recently proposed for use in getting coal

by means of lime cartridges. The bore-holes in the coal are filled with lime, which is then, by an arrangement of supply tubes, damped with water, the expansion of the lime bursting out the face of the coal, and avoiding all danger of fire. A liquid-saturated solution of lime (13 grains to 1 pint of cold water) forms *lime-water*, which has a disagreeable taste, and the alkaline property of turning vegetable yellows brown and blues green. Lime is employed for a vast number of purposes in common life, the arts, and manufactures. Among its most important applications are the making of mortar, and the amelioration of certain soils; it is extensively used also in the manufacture of cement, in soap making, in tanning as a depilatory for removing the hair and wool from skins, in the manufacture of sugar, in making caustic soda and bleaching powder, in candle making, and for various medicinal purposes. Its use for mortar depends on its property of absorbing the carbonic acid from the air, and forming carbonate of calcium. The *peroxide of calcium* differs from lime in having an additional equivalent of oxygen, which it is very prone to yield up by decomposition.

Chlorine and calcium combine to produce a chloride (CaCl) which is colourless, possesses a crystalline appearance when broken, is inodorous, very deliquescent, readily fusible, and has an extremely bitter saline taste. The anhydrous chloride melts at a low red heat. When heated it shines in the dark, and was formerly called *Homburg's Phosphorus*. The hydrated chloride ($\text{CaCl}_2 \cdot \text{H}_2\text{O}$) crystallizes in six-sided prisms. The water of crystallization is expelled by heat. The anhydrous chloride has a powerful affinity for water, and is much used in the laboratory for drying gases. It is soluble in alcohol. The hydrated chloride is soluble in one fourth of its weight of water at ordinary temperatures, and the solution is accompanied with great reduction of temperature. A mixture of this salt and snow will freeze mercury. Chloride of calcium is a good disinfectant; it is a large by-product in soda works, and is run away in enormous quantities.

The *bromide of calcium* (CaBr) is a colourless, bitter, deliquescent substance, which readily dissolves in water with the evolution of heat.

Sulphur and calcium unite in three proportions. The monosulphide (CaS) is a reddish-white compound, which is but slightly soluble in water, and suffers little change even when long kept in it. Boiling water decomposes it. This sulphide shines in the dark, and has been called *Canton's Phosphorus*. It has been recently introduced to commerce under the name of *luminous paint*, and is used for painting buoys at sea, for match-boxes, for guide-posts, and direction cards, to be visible at night—articles painted with it having the property of absorbing sufficient light during the day to render them luminous in the dark. The disulphide (CaS_2) forms a yellow crystalline hydrate ($\text{CaS}_2 \cdot 3\text{H}_2\text{O}$). The pentasulphide (Ca_5S_5) also occurs in a crystalline form. Sulphhydrate of calcium (CaHS) is an alkaline liquid which is an efficient depilatory, and has been proposed for removing the hair from hides in tanning.

Phosphorus and calcium constitute the phosphide which readily decomposes water and evolves phosphuretted hydrogen, which is spontaneously inflammable. Selenium and calcium form selenides, of which two are known. Fluorine and calcium combine to form a fluoride (CaF); this occurs largely in nature in splendid crystals and in great variety, and is known as *fluor spar*. It is much used as a flux and for the preparation of hydrofluoric acid for etching glass. It is also found in the enamel of the teeth, in the bones of animals, and in sea-water. [See **FLUOR-SPAR**.] Cyanogen and calcium form a cyanide which exists only in solution, and is decomposed by boiling.

Calcium combines with acids to form a numerous class of salts, of which the nitrate, carbonate, sulphate, and phosphate are the chief. *Calcium nitrate* gives a better

colourless solution, readily crystallized into prismatic crystals ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). When decomposed by heat the residue gives a feeble light in the dark, and has been called Baldwin's Phosphorus. It is found native, and is generally formed where animal or vegetable nitrogenous matter decomposes in the presence of lime or chalk.

Calcium carbonate constitutes the greater part of all shells, and of coral, and enters into the composition of bones. It is insoluble in water, but readily decomposed by most acids.

Calcium sulphate (gypsum, selenite, plaster of Paris) is nearly tasteless; it requires 162 times its weight of boiling water for solution; it is found native in two important forms—calc-spar and Aragonite; it is an abundant mineral, constituting limestone, marl, and chalk. It is found in most spring and river waters, to which it imparts hardness, and in sea-water. It is soluble in water containing carbonic acid, forming a bicarbonate. This salt is much employed in taking casts, in plastering walls, and as manure. The hardness arising from the presence of this salt in water is called permanent, as it is not removed by boiling, which removes the hardness produced by the carbonate. The presence of lime-salts in water involves a large expenditure of soap, as no lather can be obtained until all the lime-salts are precipitated by the fatty acids of the soap.

Calcium oxalate is a white extremely insoluble substance; it is dissolved by acids, and decomposed at a high temperature into calcium carbonate.

Phosphoric acid and *calcium* form several compounds, some of which occur in nature—the metaphosphate, the orthophosphate, and the triacidic phosphate; the latter is the most important, forming the principal constituent of bone ash. It is found in nature in a variety of forms, and is largely worked up for manures, principally from coprolites. It is insoluble in water, but is usually dissolved by oil of vitriol, and is then known as dissolved bones and soluble phosphates, or super phosphates, and forms a manufacture of considerable extent.

Chlorine and *calcium chloride* form a most important compound, used for the purposes of bleaching, and frequently called *bleaching powder* or *chloride of lime*. In solution it is employed as a disinfectant.

Some of the salts, especially the carbonates, are used in medicine. Lime, on account of its refractory character, is used in crucibles for melting platinum, or where very high temperatures are required. It is also used for the bright, which is simply a cylinder of lime rendered incandescent. Calcium is recognized in solution by the insolubility of the oxalate in acetic acid.

CALCULATING MACHINES. Before computers had attained great proficiency in performing arithmetical operations by the pen, machines by which the results of such operations could be obtained by inspection were in almost constant use. The principal of these were the *Rechensteine*, which continued to be employed in the east of Europe till the end of the fifteenth century, and in France to a later period; and the *Schwan-pan*, which in China has long been the principal means of making computations. For the operations of multiplication and division, the ivory rods of Napier, commonly called Napier's Bones, were formerly used; and for solving trigonometrical problems, Gunt's Scale or the Logarithmic Scales were once very generally employed by navigators.

The celebrated Pascal constructed, it is said, when only nineteen years of age, a machine for executing the ordinary operations of arithmetic. Subsequently to the time of Pascal, Leibnitz invented a machine by which arithmetical computations could be made, but no account of it appears to have been published.

All former contrivances for performing such operations were cast into the shade by the machines designed by the late Charles Babbage. The first of these, entitled a Difference

Engine, was designed to calculate tables of numbers for nautical and astronomical purposes by the method of differences. This he hoped to be able to accomplish with rapidity and certainty, as the machine was designed to stereotype its results without the possibility of an error in transcription. He received aid from the government to the extent of £17,000 towards its construction, in addition to which he spent large sums of his own, and gave his own services without reward through a number of years, but it was never brought to completion. The government declined in 1831 to advance any more money, and Mr. Babbage was unable to finish it unaided. During its construction, however, he conceived a design for an Analytical Engine which should be able to perform directly the operations of addition, subtraction, multiplication, and division, and directed, by means of perforated cards such as are used in the Jacquard loom, to work out any problem that the worker knew how to solve. It was also designed to print one or two copies of its results, and to produce a stereotype plate of the same if required. The construction of this has never been commenced, but complete plans were made by Mr. Babbage. The unfinished portion of the Difference Engine, which remained the property of Mr. Babbage, was placed in King's College, London.

The Swedish calculating machine of Messrs. George and Edward Scheutz is the same in principle as that of Mr. Babbage, by which it was suggested. It calculates tables by the successive addition of differences, and prints the results on moulds, from which stereotype plates are afterwards cast. It was first constructed in 1840, completed in an improved form in 1853, and exhibited in Paris in 1855. It was afterwards sent to America. Another machine designed by these gentlemen was constructed in 1860 for use in the registrar general's office, London. It proved successful, and it has been used in the computation of some of the tables published by that office. An Arithmometer, invented by M. Staffel and M. Thomas (of Colmar), to perform operations in addition, subtraction, and multiplication, is now extensively known and widely used.

CALCULUS is the general term for inorganic concretions of various kinds, formed in various parts of the body, and bearing a general resemblance in shape or composition to stones.

The most familiar instance of the last-mentioned kind of concretion is that which is deposited from the saliva and mucus of the mouth between the teeth, and upon their outward surface, and which, though called tartar, consists of the phosphate and carbonate of lime. Similar deposits, of nearly the same materials, occur under the tongue or in the substance of the cheek, in the ducts which convey the secretion of the salivary glands into the mouth. They sometimes attain a considerable size, and require an incision for their removal. Hard irregular masses of phosphate of lime, rarely larger than an almond, are also frequently met with in the lungs of consumptive patients. They are sometimes found imbedded in the pulmonary tissue, to which they adhere closely; but more frequently in the middle of tubercular deposits, especially when these take place in the substance of the bronchial glands. Calcareous deposits are also found occasionally imbedded in the muscles, on the surface of the spleen and pleura, in the brain, and other organs, and in various morbid growths of a cancerous, scrofulous, or fungous nature, as well as round foreign substances of any description retained in the body, and subject to the action of its fluids.

Gouty and rheumatic persons are subject to the deposition of a matter denominated *chalk-stones*, and resembling half-dried mortar, under the skin, about the joints chiefly of the fingers and toes. They frequently excite ulceration, and when they protrude externally may be removed; but an operation is rarely resorted to. They are found to consist of mate of soda.

Biliary Calculi, or gall-stones, are more frequently found in the gall-bladder, or the cystic and common duct, than in the liver. They are chiefly composed of cholestrin, other constituents being the bile pigment, salts of lime, and bile acids and fats. They vary in size from a pin's head to that of masses as large as a hen's egg. When solitary they are generally round or oval in shape, but when numerous they are usually faceted from compression and rubbing against each other. They give no trouble while they remain in the gall-bladder, but when one enters the bile-duct it gives rise to serious symptoms. At first there is a dull pain in the region of the liver, attended by vomiting and feverish symptoms, and this is followed by intense pain in the right side, which lasts until the stone passes into the stomach. A few hours after the attack the eyes appear yellow from bile, and the jaundice gradually spreads all over the body. Should the stone remain impacted death may occur from ulceration and the obstruction of the bile, but this very rarely happens. Generally the stone passes after a few hours, or within a day or two at most, and then the patient feels immediate relief. The treatment consists in the use of opiates to allay the pain, and the application of hot poultices or fomentation of hot water externally.

Urinary Calculi.—The URINE is a very complex fluid, holding in solution several different ingredients, which, in certain conditions of the system, are no longer kept in complete solution, but are precipitated or combined in a solid form, constituting various kinds of crystalline or sedimentary deposits, often arranged in successive layers, thus inducing those well-known affections, gravel and stone in the bladder.

Renal Calculus and Gravel.—Urinary concretions for the most part originate in the pelvis or hollow part of the kidney, either as small stones or in the form of minute sand-like crystals. In this situation they are called renal calculi (from Lat. *ren*, the kidney). They may remain there permanently, but more commonly they are carried with the urine, while yet of small size or in the form of sand, into the ureter or duct of the kidney, along which they descend more or less slowly into the bladder, with symptoms much resembling those which attend the passing of a gall-stone. These constitute what is called a fit of the gravel, and generally terminate in the expulsion of the offending matter with the urine.

Vesical Calculi.—It sometimes happens that a renal calculus, having reached the bladder in the manner described, is detained there, and becomes the nucleus of fresh concretions. Vesical calculus may also be formed upon a foreign body, such as the broken end of a catheter, or upon a small stone which has made its way inwards. In whatever way it may first arise, *vesical calculus*, or stone in the bladder, is one of the most dreadful maladies to which man is exposed.

The principal signs of the presence of a stone in the bladder are severe attacks of pain, which are intensified by exercise, the presence of gravel in the urine, a desire to void it frequently, and a smarting and burning pain after the bladder is emptied, and an occasional stoppage of the flow during the act of micturition. Many of these signs, however, may exist from other causes, and a surgical examination, made by the introduction of a metal instrument called a sound, is generally necessary to detect the presence of a stone. In the early stages of the disease treatment consists in attention to diet, and when by means of the microscope and chemical analysis the nature of the gravel is discovered, in the use of such medicines as tend to prevent its formation. In the later stages there are medicines which tend to allay the irritation of the bladder, and opiates may be used for the alleviation of the pain; but the only means that offer even a chance of a happier termination than death itself are the removal of the cause by an operation. The stone must either be withdrawn through the

urethra by a properly constructed instrument, which often succeeds when it is small in the male, and seldom fails in the female, unless it be large; or it must be drilled and crushed into fragments small enough to be voided with the urine, according to an admirable method of operating brought into notice some years since (LITHOTRITY); or an incision must be made large enough to permit its extraction (LITHOTOMY), a method practised by the ancients, and unfortunately by no means superseded (as some imagine) by lithotripsy, which is out of the question in very young children, and often inapplicable in more advanced life. The idea of dissolving the calculus is a dream. In weight they vary from a few grains even to several pounds, but seldom exceed a few ounces. They have been distinguished (chiefly by the labours of Dr. Wollaston) into the following kinds, which are here arranged neatly in the order of their frequency: 1, Uric acid; 2, oxalate of lime, called also the *mulberry calculus*, from its dark colour and rough surface; 3, ammoniaco-magnesian phosphate, called also the triple phosphate; 4, phosphate of lime, or bone-earth calculus; 5, the fusible calculus, a combination of the last two species, so called from its fusibility under the blow pipe; 6, the mixed calculus, composed of several of the other kinds confusedly mixed; 7, urate of ammonia; 8, carbonate of lime; 9, cystic oxide; 10, xanthic oxide. The last three are extremely rare.

Calculi are also found in inferior animals. *Biliary calculi* are rare in the horse and the deer, for these animals have no gall bladder, and the hepatic duct is large and straight, and the bile flows through it as fast as it is secreted. They are often found in the gall bladder of the ox, sheep, and dog. They have also been observed in the gall-bladder of almost every domestic quadruped, and very often in poultry. *Cerebral calculi* have been found more frequently in the horse than in any other quadruped. *Gastric calculi* are of frequent occurrence in ruminants. Concretions varying from the weight of a few ounces to 7 or 8 pounds have been found in the pouch of a cattle. There are traces of concentric layers in all of them, but they are far from being regular. There is usually some central nucleus, such as a small bit of nail or stone, around which has been collected a mass of earth, and food, and lain, cemented by the mucus of the stomach. A different kind of concretion is found in the abomasum, or fourth stomach of cattle, and particularly of calves. It is composed almost entirely of hairs swallowed when the cattle lick each other, agglutinated by the mucus of the stomach. Similar balls, but composed of felted wool, with other matters, are found in the fourth stomach of the sheep, the goat, the chamois, the antelope, and the deer. See BIZOARS.

Intestinal calculi are often found in the horse, but the symptoms of their existence are obscure, and can scarcely be distinguished from those of colic. *Salivary calculi* are oftener found in the herbivorous animal than in the human being. *Urinary calculi*, whether found in the kidneys, or ureters, or bladder, or urethra, have been observed in almost every domesticated animal.

CALCULUS, CALCULATION. The word *calculus* means a small pebble, such as was made use of in teaching or practising *calculation*. We must refer to articles of a more specific kind for different methods of calculation, but as regards this individual word we have only to draw the distinction between it and *mathematics*. Generally speaking, a calculator is taken for a mathematician, when he may or may not be.

The term *calculus* is commonly applied to signify any branch of mathematics which may involve or lead to calculation—any, in fact, except pure geometry. Thus the part of algebra which relates to exponents and logarithms is sometimes called the *exponential calculus*. Thus in the general signification of the terms. The word *calculus* is, however, chiefly employed to designate that branch of

the science of numbers named by mathematicians the *transcendental analysis*, a method which deals with the very highest problems in pure geometry and in physical science. It differs from arithmetic and algebra, which are employed on limited numbers, in regarding those with which it deals as infinitesimal and continuous. The method is also known as the *differential calculus*, or that which deals with the difference in value of a number at one stage of the process from that which it had at another very near it. See DIFFERENTIAL CALCULUS, and INTEGRAL CALCULUS.

CALCUTTA, the capital city of the Presidency and Province of Bengal, in India, and the seat of the supreme government of Great Britain in the East Indies, is situated on the eastern bank of the Hooghly River, or the great western branch of the Ganges, in 22° 35' N. lat., and 88° 30' E. lon., about 100 miles from the sea by the course of the river.

The city extends about 4½ miles along the bank of the river, including Fort William and the Esplanade which sur-

rounds it, and from a mile to a mile and a half from the river eastward. A quay, called the Strand, stretches from north to south all the way as far as the Esplanade. The quay is 10 feet above low-water mark, and has many broad flights of steps leading down to the water, which are useful both for the landing of goods and for enabling the natives to perform their ablutions.

The northern part of the city (Black Town) is inhabited by the native population, which is here exceedingly dense; most of the dwellings are only mud hovels, but sanitary improvements are fast progressing despite the opposition of the native landlords. The southern part (Chowringhee), in which the English and foreign residents and merchants dwell, has earned for Calcutta the name of the "city of palaces;" and no one who sees it for the first time can fail in being impressed with the magnificence of its approach and the elegance of its buildings. Every element of European as well as Asiatic luxury is here to be found; noble streets, bordered by palatial mansions, interspersed with gardens blooming with every variety of tropical plants. Here, since



Government House and Centenary Monument, Calcutta.

the olden, new streets and squares have sprung up, and the Massena villages have given place to fine streets bearing the name of Outram and other heroes. Street tramways were introduced into the city in 1871, and constitute a highly appreciated convenience.

The Esplanade is a large space which incloses Fort William, on the north, south, and east, and separates it from the city. It is the fashionable resort for riding and driving morning and night, and contains fine statues of Lord Harcourt, Lord Clarendon, General Outram, Lord May, and Lord Lytton. Along the Esplanade, on the north, is the Government House, a magnificent structure, with a circular centre supported by columns of marble, crowned by a dome, and having four wings. A short distance further north is Tank Square, a circle of which is 500 yards in length, and in the centre is a large tank 60 feet deep. The principal public buildings, besides the Government House, are, the Indian Museum (on a very fine site in Chowringhee; the Calcutta University, the Presidency College (founded in 1870), the Town Hall, the Court of Justice, the Mint,

the Bank of Bengal, the Union Bank, St. John's Cathedral, and a great number of other churches and chapels, Hindu pagodas, and Mohammedan mosques.

Fort William is about half a mile south from the Government House. It is a strong and extensive citadel, more than half a mile in diameter, is the only defence of the town, and the headquarters of the military authorities for Bengal. It is built in the form of an octagon, and contains an excellent arsenal. The interior of the fort is laid out in fine walks and grass plots.

The number of inhabitants resident in the city at the census of 1881 was 766,298. Two-thirds are males, half are Hindus, while the Mohammedans number a little less than one-third. This population is exclusive of about 180,000 dwellers in the environs, who enter the town daily in pursuit of their various avocations. The system of living in boarding-houses is very general amongst European residents.

A thorough system of drainage was completed in 1875, and its beneficial results have since been apparent in the

annually decreasing rate of mortality. The water-supply of the city, too, was vastly improved by works completed in 1870. The Hoogly water is now filtered, and brought to the city from Phulta, above Barrackpur, 18 miles from Calcutta, at the rate of 6,000,000 gallons per day.

Calcutta is the headquarters of the governor-general and of the government, and the seat of the supreme court of judicature for the Presidency of Bengal. It was visited by the Prince of Wales in 1876. The Bishop of Calcutta has a residence in the city, with a salary of £5000 a year. The Calcutta University, incorporated in 1875, takes oversight of all the Bengal colleges and schools, except the lowest. There are also numerous educational establishments, and several scientific institutions.

Calcutta possesses great advantages for inland navigation. All kinds of foreign produce are transported on the Ganges and its affluents with great facility to the north-western parts of Hindustan, over a distance of at least 1000 miles, while the productions of the interior are received at Calcutta by the same channel. The city now has also good railway communication with all parts of India. The Hoogly, opposite the city, is a mile across, and ships can anchor in 6 fathoms of water; but the navigation is dangerous on account of the shifting sands and a rapid current. A new harbour has therefore been constructed at Port Canning, and the cargoes of large vessels can there be transferred to a railway and conveyed to Calcutta, a distance of about 28 miles. The river is here spanned by a fine floating bridge, which can be opened as required for vessels to pass through.

The chief articles of export are, indigo, opium, sugar, tea, raw silk and piece-goods, saltpetre, jute, seeds, rice, hides, cotton, and cotton piece-goods. The imports consist chiefly of British cotton manufactures and cotton twist, bullion, copper, tin, lead, zinc, iron, and other metals, machinery, railway stores and materials, woollens, wines and spirits, hardware and cutlery, jewelry, watches, apparel, coffee, tea, books, stationery, ice, and pale ale. As Calcutta has nearly all the shipping of Bengal its commerce is very extensive, of which full statistics will be found in the article **BENGAL**.

In 1686 the first English factory established in Bengal was removed from Hoogly to the village of Chuttamtee, the present site of Calcutta. Fort William was soon afterwards built, and in 1756 the town was captured and plundered by Surajah Dowlah. The Europeans who were unable to escape surrendered after a short resistance. The prisoners, 146 in number, were then driven into a small guard-room, about 20 feet square, known afterwards as the "BLACK HOLE," from which only twenty-three were taken out alive the next morning. Early the following year the British, under Admiral Watson and Colonel Clive, regained possession, and a few months later the famous battle of Plassey was fought, resulting in the foundation of the supremacy of Britain in India.

CAL'DER, a river of Yorkshire, rising near Burnley, on the borders of Lancashire. After a course of 40 miles it flows into the Aire, and forms a considerable part of the Aire and Calder navigation.—There are also streams in Lancashire, Cumberland, and Lanarkshire, besides several parishes near Edinburgh, of the same name.

CAL'DERA, a seaport of Chili, on the Pacific, 30 miles N.W. of Copiapo; lat. 23° 5' S., lon. 76° 56' W. Population, about 2600. It is the port of the silver and copper mines of Copiapo, to which city there is a railway. A lighthouse has been erected at the S.W. entrance of the port. About 850 vessels, of more than 300,000 tons, annually arrive and clear. Copper-smelting kilns have been founded by an English company, which now exports from 1800 to 2000 tons of almost virgin copper. Steamers call here regularly, and there is telegraphic communication with Valparaiso and Santiago.

CALEDONIA, the name given by Tacitus and other ancient writers to the most northern part of Britain north of the estuaries of Glota and Bodotrio (the Clyde and the Forth), which formed the permanent boundaries of the Roman province. Tacitus calls the natives the "Britons who inhabit Caledonia," and he says that the reddish colour of their hair, and their large limbs, denoted them to be of German extraction. The Caledonii, afterwards known in the fourth century as Picts and Scots, were defeated 81 A.D. by Agricola, under their chief Galgacus. Caledonia has been often applied to Scotland in general, but improperly.

CALEDONIA, NEW. See **NEW CALIFORNIA**.

CALEDONIAN CANAL. See **INVERNESS-SHIRE**.

CAL'ENDAR, a register or distribution of the year, accommodated to the uses of life, containing the order of days, weeks, months, festivals, &c., as they occur in the course of the year. It is so called from the **CALENDAS**, and its original meaning is that of an account-book, all accounts being payable on the **Calends**. Hence, through the necessities of computation, the **calendarium** grew into an almanack. The year might be computed from observations of the stars, or even of any one of the planets; but the prominent natural dividers of time are, of course, the sun and moon. The early calendars are lunar, then corrections and intercalations are introduced to square the year with the seasons (since the latter depend on the sun alone), and luni-solar calendars are the result. Finally, in perfect calendars the month is abandoned except as an arbitrary division of time, and the computation becomes exclusively solar. The calendar, being of civil institution, varies according to the distributions of time in different countries.

The ancient *Egyptians* appear to have used a year of 365 days, without any additional fraction, both for civil and sacred purposes. It was divided into twelve months, each of thirty days, the five additional days being reckoned after the twelfth month. The months were assigned to three seasons, each of four months, named after divinites.

The *Jews* used a year of twelve lunar months, of 29 and 30 days, a thirteenth being introduced from time to time in order to accommodate it to the seasons. The sacred reckoning, which was instituted at the time of the Exodus, commenced with the month Abib, while by the civil reckoning the first month was Tishri or Lethaim, the seventh of the sacred year. This calendar dates from the year 3760½ before Christ, when, according to the Jewish tradition, the world was created. The year is always made to begin with a new moon, and the addition of the month, when necessary, is so managed as to bring Passover at the full moon of the vernal equinox. The Jewish year varies from 354 to 384 days in length.

The *Greek calendar* divided the year into twelve lunar months exactly following the moon's course, the month beginning with the actual appearance of the new moon—that is, after conjunction. Full moon was the middle of the month. As the moon changes in 29 days 13 hours, the months were reckoned either *full* (30 days) or *hollow* (29 days), and as twelve of such months fall short of a solar year, an extra or intercalary month was added every alternate year. Therefore the years were alternately of 354 and 384 days, giving an average of 369. This we know to be 4 days too long, and so great an error soon became manifest. It was rectified by omitting the intercalary month from time to time—that is, every seven or eight years. The Greek year began at midsummer, and the added month was that answering to our December (*Posideon*). In the lengthened years there were simply two months of December or *Posideon*. The month was divided into three weeks of 10 days each, the last week being of 9 days in the "hollow" months. The years were named after the chief archon at Athens, the chief epler at Sparta, and the chief priestess at Argos—just as after the consuls at Rome. This brings us to the Roman calendar.

The ancient *Roman calendar* was ascribed to Romulus. It was of ten months, containing the following symmetrical arrangement of the days among them:—31, 30; 31, 30; 31, 30, 30; 31, 30, 30; and giving a year of 304 days in all, divided into 38 weeks of 8 days each. The year began with March, and Quintilis (now July), Sextilis (now August), September, October, November, December, were thus really the fifth, sixth, seventh, eighth, ninth, and tenth months of the year respectively. The two first were renamed after *Julius* and *Augustus*, the two first Cæsars.

Numa Pompilius, the second king of Rome, brought the short year of Romulus nearer to the truth by adding two months, January and February, and getting a total of 355 days. The year was still lunar; and Numa arranged the necessary intercalary months on the *Metonic Cycle* of nineteen years—a remarkable piece of astronomical knowledge for the time. The Republic abandoned the lunar years of the kings, but as 10 days 5 hours 49 minutes were wanting to make the year correspond to the course of the sun, every other year an extraordinary month, called *Menais Intercalarius* or *Mercedonius*, was added between the 23rd and 24th of February. This month appears to have consisted alternately of 22 and 23 days during periods of twenty-two years, the last biennium in the twenty-two years being entirely passed over.

The early Republican year was very oddly arranged. From March to Sextilis (August) we get 31, 29; 31, 29; 31, 29 regularly. But then September has 29, October 31, November, December, and January 29, and February 28; so that in all we get four months of 31 days, seven of 29, one of 28. Added to this irregularity, the insertion of the extra month was gradually allowed to be under the control of the college of pontifices, who abused their power most shamefully, adding months to the year to lengthen the period of service for their friends amongst the great officers of state, and leaving the year at its bare 355 days when their enemies had been elected. Further, the knowledge of the decision as to the year was kept jealously secret; and as certain days were unlawful for business, it is evident that the pontifices exclusively chosen from the aristocrats held all business at their mercy. Since by the insertion of an intercalary month every subsequent business arrangement and appointment was altered for that year. It was some such irregularity which brought about the downfall of the Republic. The senate, urged that Cæsar's ten years' term of command in Gaul should expire in the spring of next B.C. instead of in the autumn, when he was to start for the consulship, tending thus to force him to disband his army, and so to get him at their mercy, Cæsar refused to accept the trick, which, as he was himself chief pontifex, he was not bound to do; he demanded his full term, and that being refused, he crossed the Rubicon and became the first of the long series of Rome's masters. One of his earliest acts was to prevent such wicked folly for the future by the organization and publication of the calendar. To put an end to such disorder, he abolished the use of the intercalations, and for that purpose, in B.C. 47, adjusted the year according to the course of the sun, and assigned to the months the number of days which they still contain, except August and February. (Augustus, when Sextilis was renamed after himself, insisted that it should be made 31 days instead of 30, as left by Julius Cæsar, and February was accordingly reduced from 29 to 28 days in ordinary years to compensate for the addition of the day to August.) Cæsar also added an intercalary day (bis-sextum) to February every fourth year. To make everything proceed regularly from the 1st of the ensuing January, he inserted in the current year, besides the intercalary month of 23 days which fell into it, two extraordinary months between November and December, the one of 33, the other of 31 days; so that this year, which was called the last year of confusion, consisted of fifteen months, or 445 days. These

67 days were inserted in order to set the year right, which was 67 days in advance of the true time. All this was effected by the care and skill of Sosigenes, an astronomer of Alexandria, whom Cæsar had brought to Rome for that purpose; and a new calendar was formed from his arrangement by Flavius, digested according to the order of the Roman festivals, and to the old manner of computing the days by Calends, Nones, and Ides, which was published and authorized by the dictator's edict.

This is the *Julian* or solar year, and continues in use to this day in all Christian countries, without any other variation than that of the *old* and *new style*. The New Style was inaugurated in 1582 by a regulation of Pope Gregory XIII., who had received many complaints of the manifestly incorrect observance of Easter. The vernal equinox, which at the time of the Council of Nice, in 325, had been on the 21st of March, then happened on the 10th. By the advice of astronomers he caused 10 days to be thrown out of the current year, between the 4th and 15th of October, and thus rectified the error. To provide for the future, since the Julian computation of 365 days 6 hours as the true (solar) year was now found to be in excess by 11 minutes 14 seconds, Gregory neutralized this excess by ordering the omission of leap year for three century-years in succession, and its insertion as usual in the fourth century-year. Thus A.D. 1700, 1800, 1900 are not leap-years; but 2000 will be leap-year as usual. The New Style is practically correct; but if we are to be quite accurate we must note that it is in error by one day in 3323 years.

This alteration of the style was immediately adopted in all Catholic countries, and in Protestant Germany, Denmark, and Sweden in 1700. In Great Britain an abortive attempt was made as early as 1581 to introduce the New Style. But under Queen Elizabeth nothing emanating from Rome had a chance of a hearing. In Scotland, however, papal influence caused it to be adopted in 1600. It was not adopted in England till the year 1752, when 11 days were dropped between the 2nd and 14th of September, so that this month contained only 19 days, and the year thus made to square with that of the other countries of Europe. In the same year also another alteration was made in England, by which the legal year, which before had begun on the 25th of March, began upon the 1st of January; this alteration first took place on the 1st of January, 1752. Russia is the only European country which still adheres to the Old Style. The difference between the two calendars is now 12 days, as the year 1800 was not reckoned as leap year. In consequence of this a special method of dating is adopted; thus the Russian bonds which are payable in other countries as well as Russia have all a double date, as November 1st; and a similar rule is observed in foreign correspondence by Russian merchants.

Of the three parts into which the Romans divided their month, the *Kalends* or *Calends* are noticed in another article. The fifth day of the month was called *Nona*, the Nones, and the thirteenth, *Idus*, the Ides, from the verb *idare*, to divide, because the Ides nearly divided the month. The Nones, from *nonus*, the ninth, were so called because, counting inclusively, they were nine days from the Ides. It was remarked above that in the Republican calendar four months (March, May, Quintilis or July, and October) had 31 days. Their Ides fell on the fifteenth day and their Nones on the seventh. But when some of the former months of 29 days were made into months of 31 days, it was deemed inexpedient to alter the divisions, and therefore their Ides still remained on the thirteenth day and their Nones on the fifth. The four original long months were still clearly distinguished in this peculiar way. A schoolboy doggerel may be useful to remember—

"In March, July, October, May,
The Nones fall on the seventh day."

For the meaning of the word **BISSEXTILE** see the article of that name. The mode of fixing any particular day was by saying that it was so many days before the Calends, Nones, or Ides next immediately following. Thus the 28th of April was the fourth day before the Calends of March; the 4th of March was the fourth day before the Nones of March; and the 9th of March was the seventh day before the Ides of March. (The Roman reckoning is always inclusive; where we say "the day before," the Romans would say "two days before," &c.)

Amongst the many world-renewing schemes of the French Revolution, a *New Republican Calendar* was invented by Romme. Monge and Lagrange aided on the mathematical side; Fabre d'Églantine produced a poetic nomenclature. The report on this new calendar of the Revolution was made to the National Convention, 6th October, 1793, and a decree was passed on 4th Frimaire (21st November, 1793) for its establishment. The Committee of Public Instruction was commissioned to cause the new calendar to be printed in various forms, with plain instructions for its use. The year was to begin at the midnight of Paris Observatory which precedes the true autumnal equinox. It was to consist of 365 days, with 12 months of 30 days each (the 30 days being three decades of 10 days each), and 5 complementary days, which were called *sansculottides* (a name afterwards repealed). A sixth complementary day was to be added, according to the words of the decree, "selon que la position de l'équinoxe le comporte," and we learn "the period of four years, at the end of which this addition of a day is ordinarily necessary, is called the *Franciade*" (art. 10 of the decree, and the remarks of Romme in the "Instruction," &c., s. iii., "De la Longueur de l'Année"). The first year of the French Republic began at midnight, the 22nd September, 1792. The second year began on the 22nd, 1793, at midnight (arts. 5 & 6 of the decree). The Gregorian reckoning was restored from and after 1st January, 1806, by an ordinance of the Emperor Napoleon I., 22nd Fructidor, An XIII. (9th Sept., 1805).

Though this calendar only lasted some fourteen years, and that in one country alone, it covers events of such incalculable importance in the history of mankind that every intelligent reader is compelled to master it if he would properly investigate the records of those events. The 10th of Thermidor, the 18th of Brumaire, are days nowise translatable into our common speech; they are for ever coupled with the end of the Terror and the end of the Republic—the death of Robespierre and the shameful triumph of Napoleon. Carlyle, in his trenchant way, considers this "not one of the least afflicting occurrences for the actual British reader of French history—confusing the soul with Messidors, 'Meadowals,' till at last, in self-defence, one is forced to construct some ground-scheme or rule of commutation. *Vendémiaire, Brumaire, Frimaire*, or as one might say in mixed English, Vintagearous, Fog-arious, Frostarious, these are our three autumn months; *Nivose, Pluviose, Ventose*, or say Snowous, Rainous, Windous, make our winter season; *Germinal, Floréal, Prairial*, or Budal, Floweral, Meadowal, are our spring season; *Messidor, Thermidor, Fructidor*, that is to say (*dor* being Greek for *gift*), Reapidor, Heatidor, Fruitidor, are republican summer." September 22nd, 1792, is Vendémiaire 1st, of year One; and the new months are all of 30 days each; therefore to the day of the French month add the number set against it in the following list, and it gives the day of the English month.

To Vendémiaire	add 21	to give September.
" Brumaire	" 21	" October.
" Frimaire	" 20	" November.
" Nivose	" 20	" December.
" Pluviose	" 19	" January.
" Ventose	" 18	" February.

To Germinal	add 20	to give March.
" Floréal	" 19	" April.
" Prairial	" 19	" May.
" Messidor	" 18	" June.
" Thermidor	" 18	" July.
" Fructidor	" 17	" August.

(Thus the 10th Thermidor, year Two, is the 28th of July, 1794.) There are five *sansculottides*, and in leap-year a sixth, to be added after Fructidor. The first Republican leap-year was year Four (1795). The old style was denominated with revolutionary fervour *style esclaire*!

Many persons overlook the fact that we still make use of a *lunar calendar* to this day. Easter is fixed by the relation it bears to the Passover and the paschal moon. Since the Passover was celebrated upon the fourteenth day of the new moon in which falls the vernal equinox, it follows that our Easter likewise depends upon the changes of the moon. A lunar calendar being thus a necessity to the fathers of the Christian Church, the problem was to discover the best lunar calendar. The nineteen years cycle was fixed upon as the most convenient, and the epoch of Golden Number was applied to any of the numbers up to nineteen which formed the cycle. In the Roman Church the golden number indicates the full moon; in the English Church it indicates the new moon. The two numbers, however, though differing in amount, really indicate the same fact. Since, in the first year after the lapse of this cycle, the new moons recur on the same days of the month as those on which they appeared during the first year of the cycle—with the difference of only one hour—it follows that if we are supplied with a table of the new moons throughout one entire cycle of the Julian era, and given also the rank of our year in its proper cycle, we shall be able to deduce the new moons for that year. But the impossibility of perfectly equalizing the solar and lunar years led to the employment of the *epact* for the purpose of discovering the new moons for the given year. Epact is a Greek word used to designate the moon's age on the 1st of January of each year, and it varies with each year of the nineteen years cycle.

To find the golden number of any year add one to the date of that year and divide by 19; then the remainder, if any, is the golden number; but if nothing remains, 19 is itself the golden number. As the new moon fell on the 1st of January the year before our era, that year was taken as the commencement of the Metonic cycle. This is the reason for the addition of 1 to the year of the Christian era.

The Dominical or Sunday Letter is a device to ascertain which day will be Sunday in any given year of our era. To find the dominical or Sunday letter for a year, add to the date of that year its fourth part, omitting fractions; divide the number thus obtained by 7. Then if there is no remainder A is the Sunday letter; but if there is any remainder the letter is as follows:—For remainder 1, G; 2, F; 3, E; 4, D; 5, C; 6, B; 0, A.

The following table gives Easter for the present century. Easter Sunday falls on the date over that Sunday letter which comes next after the golden number for the year. Thus the golden number for 1890 is 10; the Sunday letter is E. Easter falls in that year on April 6th.

Golden Number,	11	3	--	11	--	19	8	--	16	5	--
March,	21	22	23	24	25	26	27	28	29	30	31
Sunday Letter,	C	D	E	F	G	A	B	C	D	E	F
Golden Number,	13	2	--	10	--	18	7	--	15	4	--
April,	1	2	3	4	5	6	7	8	9	10	11
Sunday Letter,	G	A	B	C	D	E	F	G	A	B	C
Golden Number,	1	--	9	--	18	6	--	--	--	--	--
April,	13	14	15	16	17	18	19	20	--	--	--
Sunday Letter,	E	F	G	A	B	C	D	E	--	--	--

Here again, in spite of further modifications not necessary to be detailed, it has been found as impossible to attain perfect accuracy as with the civil calendar. Clavius (the mathematician who arranged the calendar for Gregory) admits that about the year 8100 the discrepancy will begin to be manifest.

The best work on this intricate but deeply important subject is the famous "L'Art de vérifier les Dates." Woolhouse's "Measures, &c., of all Nations" (London, 1869) is very accurate, and gives minutely detailed methods of computation, with exact tables of the years in the various calendars now in use compared with our own. This book also contains the only correct computation of Mohammedan reckoning in terms of our own calendar yet published.

CALENDERING is a general name applied to the process of smoothing, dressing, and glazing webs or textile fabrics of cotton and linen, either to prepare them for the operations of the calico-printer, or to impart the last finish to the goods before they are folded and packed for the market. The early calendarers, or calendaring machines, closely resembled a common mangle in their action, but were very huge and heavy, and worked by a horse-wheel or other sufficient power; but the process was greatly improved by the invention of a machine in which the pressure is produced between cylinders, instead of between cylinders and flat surfaces, and in which, consequently, the alternating action is got rid of, uniform and equal pressure being also more easily obtained. The rollers or cylinders were formerly made of wood; they are now usually made either of paper or of cast iron. The paper cylinders are formed by packing a great number of circular pieces of stout pasteboard upon an iron axis, and compressing them very slightly by means of iron belts passed through them, acting upon circular end-plates of cast-iron. The surface is brought to a perfectly even and polished state by turning in a lathe. Iron rollers are made hollow, and, when necessary, heated from the inside. Where a glazed or polished surface is required on the goods to be calendered, mechanism is employed to cause two adjacent rollers to revolve with different velocities, so as to produce a rubbing action.

CAL ENDS, or more properly Kalends (*Kalendar*), the first day of the Roman month. The word comes from *calo*, I proclaim; and the day was called "proclamation day," because the duty of the pontifices was to announce the commencement of the month. Two proverbial expressions as to the Kalends are well known. The first is *tristes Kalends* (Roman, "the sad fasts," for on these days the monthly interest on debts fell due). The second is *Calenda Greeca*, "the Greek Calends," arising from the same source. "I will pay on the Greek Calends" meant a refusal of payment. Since the Greeks used no such title in their calendar, Horace alludes to another traditional use of the Kalends in a well-known quotation: "Marti's calends quid agam Calendis?" ("What and I, a bachelor, to do on the first of March?") For on this day married people, and those engaged to be married, held the *Matronalia*, a festival in honour of Juno Lucina. In Roman computation of time the days at the end of a month were reckoned as so many days before the Calends of the next month. The 30th of January would be the third day before the Calends of February.

CALF. The rearing and fattening of calves is an important part of rural economy. In dairy districts the milk is so valuable that they are put rid of as early as possible, and are procured by the calf-dealers, who fatten them and put them to market to the butcher. It often happens that the poor animal, packed on their sides in a cart, with their heads hanging down, remain a considerable time without food. * Were they now allowed to satisfy their craving, a violent rumbling would ensue, and probably terminate in death. The best plan is to give them a little boiled milk at first, increasing it by degrees, and mixing starch, arrow-root, or a raw egg beat up in it, till the tone

of the stomach is restored. Air, cleanliness, and repose between the meals, whether the calf is fed by hand or sucks the cow, will generally cause it to thrive. The calf-pens should not have too much light; they should be made each for a single calf only, and so narrow that it cannot turn about and lick itself, a bad habit which calves are apt to contract. The bottom should be paved with brick, or boarded, for the sake of cleanliness. A lump of chalk is often placed in a trough for the calf to lick; it corrects acidity, and thus tends to promote health, but does not, as some suppose, make the flesh whiter. At five or six weeks old, a little sweet hay, tied in a bundle and hung up so that the animal can reach it, will induce it to pick a little, and prepare the stomach for an increase of vegetable aliment. Calves should be fat by eight or nine weeks old; it is seldom advisable to keep them above twelve weeks, as they then consume a greater quantity of milk than can be afforded. In some countries calves are killed when only a few days old; the flesh is then soft and tasteless. In France and Switzerland no calf is allowed to be killed for sale under the age of ten days. Calves intended to be reared for grazing or the dairy should be allowed to suck the mother for three or four days, then brought up by the pail, and gradually led from their milk diet to one of a vegetable nature. Boiled carrots and turnips, with cut hay, form a good food by way of introduction to their new diet. Calves are subject to two diseases in particular, namely, diarrhoea and constipation. The treatment of the first is by chalk, opium, and gentle cordials; of the latter, by doses of castor-oil, with a little ginger.

CALIBRE, a word derived from the French, used technically to describe the internal diameter or bore of any piece of ordnance. Guns of small dimensions are generally distinguished by the weight of the projectile they are designed to throw, as 13-pounder, 10-pounder, 64-pounder. Those of larger size are distinguished by their calibre, and are spoken of as 7-inch guns, 10-inch guns, the term calibre being implied. The largest pieces of ordnance are popularly referred to according to the weight of the piece, as 80-ton gun, 100-ton gun.

CALICUT (*Kalikotah*; *Kalikukaga*, "Cock-crowing;" *Kalikotah*, "Cock-fort"), a municipal town and port in the Calicut taluk, Malabar district, Madras, British India, situated on the seacoast, 6 miles N. of Bepyr, in the midst of extensive palm groves. The population in 1883 was 50,000. As the headquarters of the rich and populous district of Malabar, Calicut contains the chief revenue, magisterial, and judicial establishments of the district, with government and marine offices, a custom-house, salt depot, god, lunatic asylum, dispensary, hospitals, post and telegraph offices, travellers' bungalow, and bank. The climate is fairly healthy, and the soil being sandy the deficiency of artificial drainage is not injuriously felt. The average annual rainfall is 120 inches.

Calicut is celebrated as having been the first port in India visited by Europeans, the Portuguese adventurer Covillang having landed here about 1486. The first British settlement dates from 1616; but it was not until the treaty of Seringapatam, in 1792, that the East India Company acquired any sovereign right. The word *calico* is derived from Calicut, that being the place from which it was first brought.

CALIFORNIA, one of the United States, is bounded on the N. by Oregon, E. by Nevada and Arizona, S. by Lower California (Mexico), and W. by the Pacific. It lies between 32° 32' and 42° N. lat., and between 114° 20' and 121° 22' W. lon. The state is in shape a long parallel-ogram, 700 miles long and an average of 250 wide. The area is 153,000 square miles.

Surface.—The state may be divided, with reference to its physical geography, into the districts of the Sierra Nevada, the Sacramento and San Joaquin basins, the Coast

Mountains, and the region lying S. and S.E. of the junction of the Sierra Nevada with the Coast range. The Coast Mountains extend the whole length of the state, and they reach inland from the ocean about 30 miles. They vary in height from 4000 feet near San Francisco to 8000 in the north-west. The chief valleys along the coast are the Santa Ana, San Gabriel, Los Angeles, Salinas, Pajaro, Santa Clara, Amador, San Ramon, Suisun, Napa, Sonoma, Petaluma, Russian River, and Humboldt Bay. The basins of the Sacramento and San Joaquin comprise a vast valley, known as the Great Central Valley, bounded by the Sierra Nevada range on the E. and the Coast Mountains on the W., between lat. 35° and 40° , the whole length of which is about 450 miles, the breadth varying from 40 to 50. The Sierra Nevada extends for a distance of about 400 miles, from lat. 35° to 42° ; and N. of 38° it reaches to the E. boundary of the state. The general height of the range varies from 7000 to 11,000 feet. The highest portion lies between lat. $35^{\circ} 30'$ and 38° . In that district there are 300 square miles more than 8000 feet above the sea—at about which elevation perpetual snow is found—and 100 peaks that rise to a height of 13,000 feet and upwards. Mount Whitney, the loftiest height, reaches an eminence of 14,886 feet. On the western side of the Sierra evidences of volcanic action are met with in the remarkable precipitous gorges, known as cañons, which occur in comparatively level country, and extend to a great depth. At the bottom they are scarcely wide enough to allow of the rivers running when at their usual height. The scenery of California embraces some of the most imposing in the world. The Yosemite Valley, with its almost vertical walls of rock and splendid waterfalls, may be particularly mentioned. Another remarkable region is comprised within the fertile counties of San Bernardino and Los Angeles, and the county of San Diego. In the former and latter of these, however, are found several streams terminating in salt lakes, most of which dry up in the summer. All these lakes are so strong with alkaline salts that no fish can live in them, and the water of Mono Lake scalds the human cuticle. "Death Valley," an extraordinary depression, in $36^{\circ} 40'$ N. lat., and 117° W. lon., the "sink" of the Amargosa River, is 175 feet below the level of the sea, but much of the basin is 4000 feet above it. The valley, once evidently an extensive lake, is so called in allusion to a party of emigrants who perished here from thirst. In the N. and N.W. portions of the state the country is very rugged and thinly peopled.

Bays, Rivers, Lakes, &c.—San Francisco Bay, the best and most capacious harbour on the Pacific coast, is (including the two arms, San Pablo and San Francisco Bay proper) 60 miles in length, and in the widest part 11 miles broad, with a coast line of 27½ miles. A strait, about 2 miles wide and from 5 to 7 miles long, breaking through a range of low mountains, connects it with the ocean. This strait has been termed, not inappropriately, the Golden Gate, as it is the passage through which the multitudes from every region of the world have passed, in order to gather the wealth of this new and richer El Dorado. Within the barrier of hills already alluded to, the bay divides into two parts, the one stretching to the S. about 10 miles, and the other to the N. about 30. On the N.W. shore of the southern arm stands the city of San Francisco. The northern arm (San Pablo) is united by a second strait, Carquinez, with Suisun Bay directly E. of it, which is 15 or 20 miles long. The Golden Gate is the only channel of communication between the Pacific and the interior of California. San Diego harbour in the extreme south, though the second best port in the state, not being favourably situated on the land side; Pelican, Humboldt, Bodega, Sir Francis Drake's, Monterey, De los Esteros, Santa Barbara, and San Pedro are the other bays, all opening into the Pacific. The Sacramento and San Joaquin are the principal rivers of Cali-

fornia; and running in opposite directions, the former from the N. and the latter from the S., they drain almost the entire valley between the two great ranges, the Sierra Nevada and the Coast range, and unite about 15 miles above Suisun Bay, into which they discharge their mingled waters. The San Joaquin is about 250 miles long, the Sacramento above 300. All their chief tributaries descend the Sierra Nevada slope. The principal of these to the Sacramento are Pitt—the Feather, Yuba, and American; and of the San Joaquin, the Calaveras, the Stanislaus, the Tuolumne, and Merced rivers. The Mokelumne meets the Sacramento and San Joaquin near their junction. The Sacramento has been ascended by small steamers as far as Marysville, the San Joaquin as far as Fort Miller, and the Merced for 20 miles. The Klamath River, from Oregon, runs through the N.W. part of the state, and the Buenaventa drains part of the valley between the Sierra Nevada and Coast Mountains; both empty into the Pacific. The principal lakes are—Tulare Lake, about 35 miles long, in the S., which has an outlet into the San Joaquin River, Clear Lake, in Lake county, and Tahoe. Owen Mountain Lake and Mono Lake, in the eastern part of the state, are small.

Geology.—The higher portions of the Sierra Nevada and some spots in the Coast range are granitic; the W. slopes of the Sierra Nevada and the N.W. corner of the state are Jurassic and Triassic rocks, which contain the gold; the Coast Mountains are calcareous rocks, abounding in coal, quicksilver, and asphaltum; and the low land of the Sacramento basin lies on a Tertiary sandstone. In the N.E. and N. part of the state, there are many proofs that volcanic influences were at one time very active there. Mount Shasta and Mount Lassen are extinct volcanoes, and from the summit of the latter peak thirty extinct craters can be seen. An area of 10,000 square miles in that neighbourhood is covered with lava, and the entire elevation of Shasta above the surrounding country (which is about 1000 feet high) is of the same material, and must be 10,000 feet deep. Extensive beds of lava are found in the Sierra Nevada from lat. 42° to 38° , but little S. of the latter point. The most important lithologic formations are the Jurassic and Triassic, which are found between the Primary granite and the Tertiary sandstone, at an elevation varying from 2000 to 6000 feet. Gold may be expected where granite, slate, and quartz are found together, and these abound in the Sierra Nevada. The auriferous slates commence on a very narrow belt about lat. 36° on the slope of the mountain, and gradually widen out; but, unfortunately, about lat. 42° the wide and rich beds of gold are covered by floods of lava, and the precious metal is accessible at only a few points where some mountain stream has cut its way down through the volcanic crust. The Palæozoic and early Secondary formations are lacking in California. There is no Old Red Sandstone, and very little limestone, except some metamorphic or marble.

Minerals. The principal mineral is gold, and California is the chief gold-producing country of the world. The total amount of treasure exported from San Francisco from 1849 to 1885 inclusive was over £300,000,000. From this about £15,000,000 may be taken for treasure from Nevada, Idaho, British Columbia, Arizona, and Mexico; but £10,000,000 should be added for gold taken away without being reported at the custom-house; so that the total yield of the thirty-four years was about £325,000,000. The gold is found in placers or earthy matter, in quartz veins, and in the sand or gravel of the rivers. Within recent years, however, the annual production has much diminished. The native gold is a mixture, generally containing about one-tenth by weight of silver, which metal is also found in argentiferous veins at numerous places east of the Sierra Nevada, between Mono Lake and Fort Yuma. The two great silver-producing counties of California are Inyo and Mono, which together yield more

than 90 per cent. of the whole output. The richest quicksilver mine in the world is that of New Almaden in Santa Clara county; the annual production has been about 2,200,000 lbs., but this is falling off to a very large extent. Copper is found in half the counties of California, and many mines contain rich ore. A smelting furnace has been erected at Copperopolis, near the largest mines, and much of the ore is now smelted at home. Coal is found along the coast, but the only profitable mines are those at Mount Diablo. The quality is not first rate. Asphaltum is produced by many springs along the southern coast. Lead, iron, antimony, and cobalt are found. Diamonds have been found at Cherokee Flat, in Butte county; opals in Tuolumne and Calaveras; flint marble—white, gray, and variegated—in Tuolumne and El Dorado; alabaster in Los Angeles and Solano; and porcelain clay in Sacramento county. Warm, soda, chalybeate, sulphur, and medicinal springs abound in the Coast Mountains.

Climate.—California in its various geographical divisions has various climates. The winters are cold in proportion to altitude in the Sierra Nevada. At an elevation of 9000 feet snow lies throughout the year in deep ravines on the N.W. slopes of the mountains; at 6000 feet there is frost in every month. N. of lat. 35° fogs prevail from May to September, and keep the summits cool on the immediate coast; but as the sea breeze decreases as we recede from the coast, and the summer days become hotter. As a general rule, the climate of California cannot well be surpassed in point of salubrity. The heat on the plains in the interior is excessive in summer, but the dryness of the atmosphere enables labour to be performed without much physical exhaustion. On the coast the sea breeze keeps the temperature cool. The mean temperature at San Francisco is about 60°, the thermometer exceeding 75° in winter; the mean is 51° in Sacramento, the capital, 100 miles from San Francisco, and 80° on the coast. The mean temperature on the coast is 60° in July, and 64° in winter. The rainy season, though not continuously or even abundantly wet, usually commences about the middle of December, and continues till the first of March.

Soil and Productions.—The soil of this wonderful country is generally speaking remarkably rich, and the best suited for growing various kinds of vegetation very large crops of corn and wheat. In the counties S. of San Francisco irrigation is resorted to, the water when not procurable in the rivers, being gottered by means of Artesian wells. The area of land in the state is about 100,000,000 acres, of which 25,000,000 are for agricultural land, about 40,000,000 grazing, and the rest rugged mountain and timber land. In the Sacramento valley the land available for cultivation is estimated at upwards of 5,000,000 acres, which is generally the best soil, as it is free from drought; some of the Southern upland valleys, including the fertile foot-hills, and small valleys to the south, it is set down at 10,000,000, of which only about one-tenth is under tillage. In 1880, the total area of land under cultivation did not exceed 500,000 acres, but the enormous capacity of the state for the growth of cereals is shown by the fact that from this small area 35,000,000 bushels of wheat, 12,000,000 bushels of barley, 2,000,000 bushels of oats, and 1,500,000 bushels of corn were produced in one year. California is, in fact, becoming the granary of a larger number of a mining state, more especially as the needs of gold production divert attention to farming. The immense acreage on which farming is carried on may be gauged from the fact that while wheat fields of from 1000 to 5000 acres are quite common, there are farms extending over an area of from 20,000 to 40,000 acres! Ploughing is done in November, in the light soil is but superficially cultivated in December, and by the beginning of May much of the wheat and barley, which is then well grown, is cut for immediate use as fodder or for hay. The same ground is then planted with

maize, and yields a second heavy crop. Sometimes (especially if the land be irrigated) this maize grows to a height of 18 feet, and bears immense corn-cobs, yielding 90 bushels to the acre. If, instead of cutting the wheat green, it is left to ripen, it is fit for harvest by the end of May, and as there is no rain after April, the wheat-heads, after being cut off by machinery, are threshed and placed in sacks in the open field, while the straw is left piled in stacks until ready for conveyance to the nearest railway. In addition to this, in consequence of the large amount of seed which falls, with, perhaps, the additional aid of a little more grain, and by the simple process of lightly ploughing over the soil, a second, though necessarily smaller crop, is yielded. The climate is particularly favourable to the grape, the hop, the olive, and tobacco-plant, and produces all kinds of vegetables of astonishing size. Fruit-trees grow rapidly, commencing to bear at an early age; and the growth and export of oranges and lemons has become quite an important and very profitable undertaking. Vast tracts, over which hitherto large herds of horses, cattle, and sheep have been allowed to roam undisturbed, are now being offered by the government in grants of 160 acres to a class known as *pre-emptors*, who may in five years become owners, on condition that they live upon the land and cultivate it.

Forest-trees. The low land of the Sacramento basin, the Coast Mountains S. of 37°, the Colorado Desert, and the Mohave basin are, except in a few spots, bare of trees; but there are dense forests on the Sierra Nevada, and on the coast N. of the Golden Gate. The largest tree of the state is the *Sequoia gigantea*, which grows to 30 feet in diameter; next to it is the redwood (*Sequoia sempervirens*), which grows 20 feet thick; the sugar pine, the red fir, the yellow fir, and the arbo-vite reach a diameter of 10 feet, and all sometimes grow to the height of 300 feet. The redwood is found between Monterey and Crescent City, within the district where heavy fog prevails; the other large trees are most abundant in the Sierra Nevada. These trees are all evergreens and conifers; they were first discovered by Mr. Lobb, an Englishman who had been sent out by Messrs. Vitch, the nurserymen of Exeter and Chelsea. The deciduous trees occupy but a small place in the forests of California. The western yellow pine, balsam fir, juniper, cedar, nutmeg, laurel, madroña, manzanita, white oak, evergreen oak, and chestnut oak grow in the mountains and valleys. The pitahaya or gigantic cactus, the yucca or bayonet-tree, and the mesquit flourish in the Colorado Desert and the Mohave basin. A large amount of timber is exported. There is, however, along the Coast range a scarcity of the timber requisite for the construction of waggons and similar purposes, for the supply of which large quantities of the needed kind are imported on the land side.

Animals.—The grizzly bear is the most formidable animal of California, though it usually flees at the sight of man. The elk was once abundant, but is now rare, and in a few years will entirely disappear. The black-tailed deer is found in the hills and low mountains, the prong-horned antelope in the valleys and deserts, the mountain sheep in the high mountains. The Californian lion, or cougar, frequents thickets, from which he sallies out to catch colts, calves, sheep, and pigs. The coyote, a small wolf, is very abundant, and does much damage among the lambs, pigs, and poultry. Wild cats, foxes, raccoons, and large wolves are found, but they are not numerous. Hares, squirrels, and semipalmated birds, especially the last, which do great injury to the grain fields. The seal, sea-lion, and sea-otter are found in the sea; the otter, minx, and beaver in the streams. The Californian vulture is, next to the condor, the largest bird that flies, and it measures 10 feet across from tip to tip of its outstretched wings. The turkey-buzzard, the golden eagle, the bald eagle, the fish-

hawk, the road-runner, the Californian partridge, the Californian quail, the trumpeter swan, the American swan, and many varieties of wild geese and ducks, are found in the state. The quail and partridge are very beautiful birds. In the rivers salmon and sturgeon are numerous; in the sea, halibut, rock-fish, turbot, jew-fish, sun-fish, green-fish, sea-bass, smelts, anchovies, herring, sardines; in the brooks, trout; and in Lake Tahoe a large fish called salmon trout. Oysters are rare; clams and crabs abundant. Rattlesnakes, tarantulas, scorpions, and centipedes are occasionally seen.

Manufactures, &c.—The chief articles of manufacture are sawn lumber, furniture, mining machinery, steam engines and heavy castings, iron, steel, and hemp ropes; coarse glass bottles, stoneware, leather, blankets, and cloth; gunpowder, fireworks, pitch, turpentine, silverware, gold quartz jewelry, wrapping and printing paper, friction matches, carriages, soap, beer, borax, lime, and steamboats and schooners. Wines of all descriptions are made in large quantities, in many cases by the grape-growers themselves; and tinned fruits, vegetables, and meat, as well as honey and hides, are exported to a very considerable extent. The manufacture of beet root sugar, which is of recent growth, promises to develop largely. The chief articles imported from Great Britain are iron; manufactures of iron, steel, tin, glass, flax, and jute; cotton and woollen goods, earthenware, and coal. All the commerce of this state centres at SAN FRANCISCO.

In 1885 there were 2200 miles of railway in California, connecting the capital with all the chief towns. In 1869 the Union Pacific line was completed, affording unbroken communication between New York and San Francisco. This line is 3300 miles in length, and the journey across the American continent is performed in five days. Railway communication has also been extended to the southern extremity of the Great Valley, and the Southern Pacific Railroad, with its branches, connects the state with New Orleans. There are no navigable canals in the state, but irrigation canals are being carried through the San Joaquin valley from the Tulare Lake to Antioch.

Population.—According to the census of 1880 there were in that year 864,694 inhabitants in California. Of these, 572,006 were native born, and 292,688 of foreign birth. Among the foreigners were no less than 75,132 from China, 40,000 from Ireland, 25,000 from Germany, 15,000 from England, and 32,700 from other countries. The aboriginal inhabitants—numbering about 16,000—are in a miserable and degraded condition. The Chinese, who are a thrifty, sober, honest, docile, and industrious people, have penetrated into all departments of labour, and greatly aided in the prosperity of the state.

History.—When the peninsula (now known as Lower California) was discovered in 1534, by an expedition sent out by Cortez, the name "California" was applied to it, and for more than 200 years that was the California known to Europeans, although the name was also extended to the coast farther north. In 1542 the present State of California was seen for the first time by a white man, Juan Rodriguez Cabrillo, a Portuguese navigator in the service of Spain. Sir Francis Drake, who explored these coasts in 1578, is believed to have refitted his fleet in the bay known by his name. The Jesuits, who settled towards the end of the seventeenth century in Lower California, were, on their expulsion, succeeded by the Franciscan friars, a party of whom in 1769, under the command of Junipero Serra, came from the peninsula, and established missions for the conversion of the Indians, and thus made a permanent white settlement. From this time the country north of San Diego was called Alta (Upper) or New California, while the peninsula was styled Old or Lower California. In 1821 California became a portion of independent Mexico, and afterwards a territory under the republican government. On the 7th of July, 1846, the American navy

seized Monterey, the capital of Upper California, and from that day the American authority dates. On the 19th January, 1848, the gold mines of the Sierra Nevada were discovered by James W. Marshall, an American, and a month later Upper California was by treaty ceded to the United States. The mines astonished the world by the vast amount of their production, and within fifteen months after their discovery 100,000 people had started for the new El Dorado. On the 31st of March, 1849, the first ocean steamer arrived at San Francisco, and from that time California had regular steam communication with the Atlantic states. Lower California was forgotten; the only California before the eyes of the world was the new land of gold, which thus usurped the name which had once belonged exclusively to the peninsula. The state was admitted into the Union in September, 1850.

CALIFORNIA, GULF OF, which was first visited by Hernando de Grijalva in 1534, extends along the W. coast of America, between the mainland and the peninsula of California, beginning on the S. between Cape Palm in California (about 23° 10' N. lat.) and the port of Mazatlan on the mainland (about 23° 30'), and extending N.W. to the mouth of the Rio Colorado (30° N. lat.); its length is about 700 miles, and its breadth varies between 150 and 40 miles. From its shape it is sometimes called the Adriatic of the New World. It abounds in fish of the finest sorts—in seals, turtles, and tortoises; and the sperm whale haunts its mouth. The pearl fishery near La Paz, in lat. 24°, once lucrative, is now of little importance. The rise of the tide is from 6½ to 7 feet, and a current usually flows down the gulf, due to the influx of the Colorado and Gila rivers.

CALIGULA was the third Roman emperor, and the fourth of the "Cæsars." Julius, the first Caesar, although emperor for life, and quite as truly emperor as his successors, being better known as the "great dictator," Caligula was a nickname: the emperor's name was really Caius Cæsar. When he was a boy amongst the armies of his father on the Rhine, he used to wear the *caliga*, or military boot, with a short tip turned over at the upper edge, resembling the Spanish boots of the middle ages; the soldiers therefore gave him the pet name *caligula*, or "bootikin." Caius Cæsar was born A.D. 12. He was the great grandson of Augustus, being the third son of Anippina the Elder, the only daughter of Julia, daughter of Augustus. Anippina had married Germanicus, a plebe of Tiberius, who indeed adopted him. Caligula was therefore great-grandson of the first emperor, and great-nephew of the second. He and his brothers were the nearest heirs to the throne after the death of the son of Tiberius. Presuming on this, Nero, the eldest brother, conspired against Tiberius, and was put to death; the second, Drusus, died before Tiberius; Caius, the third, succeeded A.D. 37.

Tiberius had reigned twenty-two years, and for ten years had lived completely secluded in the island of Caprea (Capri), in the bay of Naples. The empire was managed through reports brought to the old man (now seventy-eight) by professional spies, and much tyranny naturally resulted. When Tiberius was supposed to be dead, therefore, there was unfeigned rejoicing, and young Caius, who was with him (at Lucullus' villa, on the promontory of Misenum), came forth and was saluted as emperor. But Tiberius roused again, and called for food. Caius was in the greatest terror, for his great uncle had not even named him as successor, and he knew his life would pay the forfeit of his rashness if it were discovered. The chief of the prætorian guards, Macro, ordered a quantity of clothes to be thrown on the dying emperor, who was then left alone to perish by suffocation. The first acts of Caligula brought him enthusiastic popularity. He released the state prisoners, returned much power to the various magistrates, of which they had been deprived by the late emperor—restored

Herod's grandson, Agrippa, to his kingdom of Judaea, and did many other generous and spirited things. But after eight months he fell dangerously ill, and rose from his sick-bed a madman. It is incredible that he should have continued to reign for more than three years. Sometimes he would have fits of craving for blood, and would cause spectators to be thrown to the beasts in the amphitheatre, or would banquet while prisoners were tortured to death before his eyes. It was this brute who said he wished the Roman people had but one head, that he might strike it off at a blow. At other times he plunged into the merest follies, creating his horse a consul, and feeding him on gilded oats. His conduct with women was at all times unutterably wicked. Finally, he became quite outrageous, built a temple to himself, and appointed priests as to a god. Living on the imperial hill, the Palatine, he began to construct a huge bridge, the foundations of which are still standing, across to the Capitol hill, where stood the temple of Jupiter Capitolinus, so that Jupiter might the more easily come across to consult with him. The new god never lived to finish this bridge, but he did finish another bridge, namely one of boats, over 2 miles long, between Puteoli (now Pozzuoli) and Baiae, which he covered so that it looked as if it were solid ground. The end of this was that, giving a banquet in one of the palaces on this costly construction, the fancy seized the ferocious madman to sink the whole and drown his guests, which he accordingly ordered to be done, and many perished. In A.D. 40 he marched with an army to Gaul to get money for the exhausted treasury, drew up his soldiers in sight of Britain, but fearing to cross commanded them to collect shells as "spoils of the ocean." Even this was not enough, and he returned to Rome safely. But his conduct growing more abominable than ever, a plot was formed against him, and one of the officers of the praetorian guards put him to death, January, 41. He was succeeded by the elderly Claudius, his father's brother.

CALIPH, CALIF, or KALIF (Arabic, successor), the title given by Mohammedans to their sovereign, whom they regard in the light of the successor or vicar of the Prophet. After the death of Mohammed, in 632, Abu Bekr, father of Ayesha, favourite wife of the Prophet, was, after a contest with three rival candidates, Omar, Othman, and Ali, elected to be his successor. He assumed the title of Caliph Resul Allah (i.e. the Representative of the Prophet of God), and continued that course of conquest which had been commenced by Mohammed. He nominated as his successor Omar, another father-in-law of the Prophet, who received the title Amir al Muminin, afterwards Mumin, Miramolin (Commander of the Faithful), a title which was retained by all subsequent independent caliphs. During the sway of Omar, Syria was completely conquered, and Egypt was also overrun and annexed to the Mohammedan empire. On his death Othman was elected his successor, by the council of the six companions, which had been appointed by Omar for this purpose. He was succeeded by Ali-ben Abi Taleb, who was appointed by the people of Medina, and who was the first to assume the title of Caliph of Imam or high-priest. By the Shiites he is regarded with scarcely less veneration than the Prophet himself. He lost, however, much of the temporal power that had been exercised by his predecessors, and on his death Mu'awiyah, the governor of Syria, Egypt, and part of Arabia, and head of the family of Ommiah, became independent, removed the seat of the caliphate to Damascus, and founded the dynasty of the Ommiades, who reigned from 661 to 752 A.D. During this period the Mohammedan power attained its highest prosperity and widest dominion. Turkestan was conquered in 707, Galatia in 719, and after two descents on Spain, 719-711, the Gothic monarchy was destroyed and Spain came under the dominion of the Moors. In 752 the Ommiad dynasty gave place to that of the

Abbasides in Asia, though independent caliphates at Cordova and in Arabia were formed by branches of the former family. By the Abbasides the caliphate was removed to Bagdad, but the united empire had ceased to exist, and in course of time the caliphate became merely a nominal sovereignty, the real power and authority being vested in the emirs. In 1258 Bagdad was taken by the Tartars, and the caliph fled to Egypt, where the Mameluke sultans continued to honour him and his successors as the spiritual head of Mohammedanism until 1517, when Egypt was conquered by the Turks under Selim I. The last of the caliphs was carried to Constantinople, and the title was assumed by the Turkish sultans, by whom it has since been retained.

CALISAYA BARK is the best of all cinchona barks. It is the product of *Cinchona Calisaya*, a large tree discovered by Dr. Weddell in 1847. It grows on the Andes at an elevation of from 4500 to 5400 feet, on the borders of Bolivia and South Peru. It has been introduced into India and Java, and it is from these countries that we get our supply. The variety *Ledgeriana* is especially valuable. The flowers are like those of *Cinchona officinalis*, but the corolla is somewhat shorter, and the capsule is only half an inch long, whereas in *Cinchona officinalis* it is three-quarters of an inch long, and is marked with longitudinal ribs. See CINCHONA.

CALITRI, a town of Italy, in the province of Principato Ultra or Avellino, about 7 miles E.N.E. of Conza, containing 7000 inhabitants, chiefly engaged in agricultural pursuits. It is situated near the river Ofanto, on the supposed site of the ancient *Actrium*.

CALIXTINES, a Bohemian religious sect which formed the larger of the two parties into which the Hussites were divided in the civil war of the fifteenth century. Their name was derived from the Latin *calix*, a cup, because they contended for the administration of the cup as well as the consecrated bread to the laity in the celebration of the eucharist. Their demands were partially granted at the Council of Basel (1433), and having gained a victory over the more extreme sect of the Taborites in 1434, they became the dominant party in Bohemia for a considerable period. Many of them afterwards became absorbed by the Roman Catholics, while others joined the Taborites, and about the beginning of the sixteenth century the sect ceased to have any political importance.

CALIXTUS was the name taken by three of the popes. Calixtus I. (217-222) received the honour of canonization as St. Calixtus. He was martyred under Heliogabalus. Calixtus II. was the title taken by Guy of Burgundy on his elevation in 1119. He was one of the most illustrious of the earlier mediæval popes, and had the good fortune in 1122 to settle the question of *INVESTITURE*, so far as Germany was concerned, in favour of the Roman pretensions. He reigned five years only. Calixtus III. was Alfonso Borja, a Spaniard, the founder of the family so detestable to us under the Italianized form of its name as Borja. He was bishop of Valencia and privy councillor of the King of Aragon in Spain. He was chosen pope in 1455, and reigned till 1458. He succeeded the learned and exemplary pope, Nicholas V.

CALL. In Protestant theology this term is used to designate, first, the general invitation given to all men in the gospel; and secondly, the influence of the Holy Spirit upon individual souls, by means of which they are brought into communion with God. According to the tenets of Calvinism, the former is addressed to all men, but only the elect among them are the recipients of the second, which when given is always effectual and irresistible in its operation, and without which men cannot receive salvation. [See CALVINISM.] In ecclesiastical affairs those who seek to enter the ministry are in many churches examined as to whether they believe that they are called of God to undertake the work. In the Church of England every candidate

for the office of deacon, priest, or bishop is required to profess that he is inwardly moved by the Holy Ghost to undertake the office. The change from one pastorate to another in the Presbyterian, Independent, and Baptist churches is generally termed a call. In most of the Independent and Baptist churches the members invite or call their pastor; while in the various branches of Methodism invitations are given by the circuit stewards, the sanction of the Annual Conference being always required for the appointment. In Scotland there has ever been considerable controversy as to what constitutes an effectual call in this matter, but the consent of the congregation as an essential part is now recognized in all the churches.

CALL, in military affairs, is the name given to the signals given by the bugle, and in the navy to the metal whistle used by the boatswain and his mates.

CALL, in mercantile matters, is the name used for the instalments required on the shares of a joint-stock undertaking. When a new company is started the shares are generally offered to the public, on the payment of a certain sum on application, and a further sum on allotment. The remainder required to make up the share is generally paid by means of calls made at certain stated intervals. In applying for or purchasing shares on which only a portion of the capital has been paid, the holder becomes liable for the uncalled balance.

CALL (to the bar), the term used in England and Ireland to denote the public reception of law students to the rights and privileges of the degree of barrister. In Scotland the corresponding term is *passing advocate*.

CALL OF THE HOUSE is the name given to a measure designed to enforce the attendance of every member of either House of Parliament in cases of extreme urgency. In the House of Lords, when an order has been passed that the House should be called over, letters have been sometimes sent to the peers by the lord chancellor requesting their attendance, as in 1810, during the illness of George III., and in 1820, for the trial of Queen Caroline.

In the House of Commons it has been usual to name a day for the calling over, allowing a sufficient interval for the attendance of the members from all parts of the country. To the order is appended a resolution, "that such members as shall not then attend be sent for in custody of the sergeant-at-arms." At the time appointed for the call the order of the day is read, and then may be proceeded with, postponed, or discharged, as the House may decide. When it is decided to proceed with it, the names are called over from the return book, according to the counties, which are ranged in alphabetical order. The members for the counties are called first, then those for every city or borough within it—England and Wales first, then Scotland and Ireland in their order. The last call of the House of Commons was in 1836.

CAL'LANDER, a village of Scotland, in Perthshire, on the river Teith, about 16 miles N.W. of Stirling, and a station on a branch of the Caledonian Railway. It is very much resorted to by tourists and summer visitors, the scenery around being very fine, and many favourite spots being within easy distance. The village is substantially built, and contains Established and Free churches, and an excellent hotel. There is a hydropathic establishment about half a mile distant, and many handsome villas extend both east and west of the village proper. Population (1881), 2167.

CALLA'O, the principal seaport town in Peru, in 12° 4' S. lat., and 77° 4' W. lon. Population, 36,000. The bay is formed by the island of San Lorenzo, which protects it on the west from the swell of the ocean, and by a low projection from the mainland. The anchorage in the bay is safe, and the depth of water is from 7 to 10 fathoms. A shoal extends about 400 yards from the beach, except immediately opposite the town; here a fine mole has been formed, within which vessels of large burden may lie and discharge

their cargoes. A large dock was also completed in 1875, in addition to which there is a floating dock, which has proved of great utility for vessels on the Pacific coast. Callao is the port of Lima, 8½ miles distant, and partakes largely of the abundant prosperity of the capital of Peru. It is the headquarters of the Pacific Steam Navigation Company in South America, as well as of some French and German lines. Its customs receipts exceed the total collected from all the other ports of the country. The old town of Callao was destroyed by an earthquake in 1746; vestiges of it may still be seen at low water. The present town is further from the sea than the old town, and escaped with but little injury in the great earthquake of 1868. Owing to the mildness of the climate, and the frequency of earthquakes, the houses are generally built of light materials. The most substantial buildings are the three forts, which command the harbour, the barracks, and the custom-house.

A railway connects the town with Lima and several other important towns. The exports are guano, specie, copper, wool, cotton, bark, and hides. About 2000 vessels, of 460,000 tons burden, annually enter and clear the port, one-third of which is British, and one-third belongs to the United States. The exports and imports yearly exceed £6,000,000. The climate is good, but the absence of rain and the consequent bad supply of water, together with sulphurous emanations from the harbour, and the insufficient sanitary arrangements, render it by no means a healthy place. The seasons vary but little, and thunder and lightning are unknown.

In 1624 Callao was unsuccessfully besieged for five months by Dutch pirates. Since the beginning of the present century it has had a somewhat eventful history, and has figured prominently in the frequent revolutions which have taken place. In 1820 Lord Cochrane gallantly cut out the *Esmeralda*, a large Spanish ship of war, from under the guns of the fort. In the following year the city was surrendered to the Republican forces by the Spaniards. It was here that in 1865 a treaty was signed by Spain, whereby, on payment of 60,000,000 reals, the Chincha Islands—then the chief source of the supply of guano—were acknowledged to be Peruvian territory. During the contest between Chili and Peru in 1881 Callao capitulated to the Chilean fleet.

CALLCOTT, JOHN WALL, Mus. Doct., the favourite composer of glee and other vocal part music, was born in 1766, at Kensington, where his father carried on the business of a builder. Music, at first his amusement, became his profession, the study of which he prosecuted without any master; though by a constant attendance at the Chapel Royal, at Westminster Abbey, and many concerts, together with the friendly hints given in frequent conversation with Dr. Cooke and Dr. Arnold, he no doubt profited very largely.

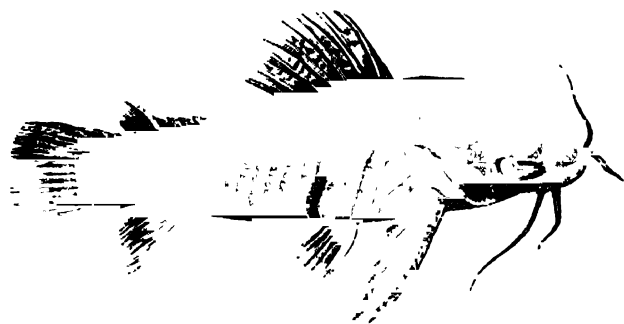
He commenced his professional career as deputy-organist of St. George the Martyr, Queen Square. In 1785, when only nineteen years of age, he appeared as a candidate for the prizes annually given by the Catch Club, and obtained three out of the four gold medals.

At the early age of nineteen Callcott was admitted Bachelor in Music by the University of Oxford. In 1787 he assisted in forming the Glee Club. In 1790 he took advantage of the arrival of Haydn in this country, and derived considerable knowledge in instrumental composition from that illustrious musician. He advanced to the degree of Doctor in Music, at Oxford, in 1790. His "Musical Grammar" appeared in 1805. About the year 1806 he undertook to lecture on music at the Royal Institution, as successor to Dr. Croft; but his mind, long overstrained, sank under the burdens he had laid upon it. His mental powers were never permanently restored. He died in May, 1821.

The productions of this original and ingenious composer

are too numerous, and indeed too well known, to be particularized here: the choicest of them were, in 1821, collected and published in two handsome volumes, by his son-in-law, Mr. Horsley.

CALLICHTHYS is a genus of fishes belonging to the family Siluridae, or CAT-FISHES, in the order PHYSOSTOMI. In this genus the body is almost entirely protected by four ranges of large hard scaly plates; the head is also protected with plates of the same texture. The snout and under surface of the body are the only naked parts. The mouth is not deeply cleft, and is furnished with a pair of maxillary barbels on each side, which are united at the base. The teeth are very small, or entirely absent. The eyes are small, and situated on the side of the head. The ventral fins have six rays, the dorsal seven or eight and a feeble spine; the adipose and the anal are short. The species of



Atipa (Callichthys latirostris).

this genus are found in tropical America, and generally frequent rivers and streams. Like eels, they can live for a considerable time out of water, and as they are natives of hot countries the streams which they inhabit not unfrequently dry up; when such is the case they are said to perform long journeys overland, using their strong and bony pretertorian fin as a propeller, in quest of some other stream. In some places they bury themselves in the mud. Some species of this genus have the habit of constructing nests, either of grass or leaves. In these nests they deposit their eggs, and both sexes keep watch over them carefully till they are hatched.

CALLIDIUM is a genus of beetles belonging to the group LONGICORNIA and family CURCULIONIDÆ. The following are the generic characters:—Body depressed, thorax wider than the head, rounded at the sides; antennæ generally shorter than the body; palpi small or short; the terminal joint thicker than the rest, and truncated at the apex; legs short; tibiae simple.

Callidium bagulum is not an uncommon insect in this country: it lives during the larval state in fir timber, and when it occurs plentifully is exceedingly destructive. The perfect insect is about $\frac{3}{4}$ inch long, of a flattened, elongate form and dull black or pitch colour; the thorax is slightly hairy, and the elytra are furnished with a bunch of silvery white hairs.

Instances have been recorded of these insects attacking the fir rafters of houses, to which they are of course exceedingly injurious; and instances are known in which the perfect insects, in order to effect their escape, have perforated the lead with which the house-top was covered.

In many of the deal palings in the neighbourhood of London, and elsewhere, numerous coal-shaped holes (about $\frac{1}{2}$ inch in diameter) may be observed; these are formed by the perfect insect of this species of *Callidium* to effect their escape, having passed through the larva and pupa states within the wood.

CALLING HARE (*Lagomys*) is the name given to a genus of the family Leporida, in the order RODENTIA, from the peculiar piping or whistling noise that they make. These animals, also called *Pikas*, have the head longer than in the common HARE, and thickly covered with fur, even to the tip of the nose; there are numerous hairs in the whiskers. The ears are short and rounded; the legs are short and nearly equal in length. The clavicles are nearly complete, and there is no tail. The molar teeth are twenty in number, five on either side of each jaw; the soles of the feet are hairy. The calling hares are found in Northern Asia, extending as far south as the Himalayas and Nepal. In Europe, a species has been found in Russia, and one species inhabits the Rocky Mountains of North America.

The Common Calling Hare (*Lagomys pusillus*) is a native of the south-eastern parts of Russia, and is found about all the ridge spreading from the Ural chain to the south, about the Irtysh, and in the western part of the Altaic chain, but nowhere in the eastern beyond the Obi. The body is about 6 inches only in length. The fur has a greenish-brown colour, being hoary underneath. The calling hares frequent sunny banks in the neighbourhood of woods. They form burrows amongst the shrubs and herbage, their openings being difficult to detect, but for the peculiar cry which the occupants make. This noise, which has been compared to the piping of a quail, and can be heard at a considerable distance, is uttered at regular intervals every morning and evening, and sometimes during the day if the weather be cloudy. Both the male and female emit this note, but the latter is silent for some time after she has given birth (in May) to her young, which are born naked and blind.

The Little-Chief Hare (*Lagomys princeps*) is the name applied by Sir John Richardson to one of the *Pikas* or Calling Hares, less than 7 inches in length, and inhabiting the Rocky Mountains of North America. The fur is blackish-brown above and grayish beneath, the head being short and thick, and the ears somewhat rounded. It has no tail. "It is often seen at sunset, mounted on a stone, and calling to its mates by a peculiar shrill whistle. On the approach of man it utters a feeble cry, like the squeak of a rabbit when hurt, and instantly disappears, to reappear in a minute or two at the distance of twenty or thirty yards, if the object of its apprehension remains stationary." They do not appear to construct any kind of burrow, but make their habitations among crevices in the limestone rocks. The little-chief hare is distinguished from its congeners in presenting small digital pads at the base and end of its toes; these have a black tint. The claws are also dark-coloured, short, compressed, and concealed by the fur.

The calling hares are found fossil in the Pliocene beds of Eningen, and in Post-tertiary deposits in Britain and Southern Europe, as well as in the bone breccias of Corsica and elsewhere.

CALLING THE DIET is the Scotch law term for ARRANGING. Before a prisoner can be placed upon his trial a copy of the indictment, with a list of the witnesses to be examined against him, and a list of the jury assize, must have been served at least fifteen days previously. On being placed at the bar of the court, he is presumed to know the nature of the charge preferred against him. If, however, he or his counsel require it, the indictment is read aloud by the clerk of the court, and if the prisoner has any objection to the relevancy he must then state it. If he does this the court then proceeds to consider the objection, and when a decision is given in favour of the prisoner the indictment fails, and the prisoner is remanded to gaol until

a new one is preferred, unless the prosecutor decides to abandon the charge, in which case the prisoner is discharged. If, however, the court rules against the objection raised by prisoner, he is then called upon to plead "guilty" or "not guilty" to the indictment made against him.

CALLINGTON, a small town near the eastern border of the county of Cornwall, 12 miles S. of Launceston, 251 from London, and $9\frac{1}{2}$ from the Saltash station on the Great Western Railway. It stands in a low situation, not far from the Lynher, a feeder of the Tamar. The houses are chiefly arranged in one broad street. The church, or rather chapel, was almost rebuilt about the middle of the fourteenth century, and has recently been restored. A celebrated school is established at Callington, which received special attention in the report of the Schools' Inquiry Commission of 1868. Population in 1881, 1925.

CALLISTO, in the Greek mythology, was a nymph of Arcadia, and one of the huntresses of the train of the goddess Artemis (Diana). Zeus loved her; and Hera, discovering the amour, changed Callisto to a bear to shield her from the rage of the goddess. Hera frustrated the deception, and caused Artemis to pursue and kill the seeming bear, whereupon Zeus set Callisto amongst the stars as the constellation Aretos (the Great Bear). Ovid adds a further touch to the myth, giving the unhappy huntress a son by Zeus, named Arcas; and, according to the poet, it was this son who was on the point of killing his own mother in a bear hunt, brought about through the arts of Hera, when Zeus interposed and placed both mother and son in the sky. Arcas became the constellation Arcturus (now called Boötes), perpetually pursuing the Bear amongst the stars. See ARCTOS, ARCTURUS.

CAL LITRIS. See SCIRILLIS MONKLY.

CAL LITRIS is a genus of trees or shrubs, belonging to the same tribe of CONFERTÆ as the CYPRESS and ARBOR VITÆ. There are fourteen species, natives of Africa, Madagascar, Australia, and New Caledonia. *Callitris quadrivalvis* is a native of Barbary, and attains a height of from 15 to 20 feet. It was first discovered by Desfontaines on Mount Atlas in 1796. The gum-sandarae of commerce is the produce of this tree. The wood is very valuable, and is used in North Africa in the interior construction of mosques and the houses of the wealthy. It is hard, durable, of a mahogany colour, and a fragrant balsamic odour.

In the genus *Callitris* the bract-scales of the cone are four, six, or eight, all fertile, arranged in two series (except in one species), and opening valvately. The ovule-bearing scales are adnate to the bract-scales, and there are several erect ovules at the base of each. The leaves are generally reduced to minute, thick, keeled scales, three or four in a whorl, or opposite, arranged decussately.

CALMAR or **KALMAR**, a town of Sweden, about 190 miles from Stockholm, in $56^{\circ} 40'$ N. lat., and $16^{\circ} 20'$ E. lon., in that portion of the ancient province of Smaland which now forms the division of Kalmar Län. The town itself is on the isle of Quarnholm, in the strait of Oeland. It is united by a bridge of boats to a suburb, which is on the continent. The suburb contains a strongly fortified castle, in which the peace of Calmar was concluded in 1397, whereby the kingdoms of Denmark, Sweden, and Norway were united under one sovereign. The town is regularly built, but few of the houses are of stone. The most remarkable buildings are the cathedral and town-hall. There are also an academy and a gymnasium. The harbour is good, and the commerce of the town active. It exports flax, iron, alum, pitch, tar, boards, &c., and a great quantity of stone from the quarries of Oeland. Many vessels are built here. There are manufactures of woollen stuffs, snuff, and potash. In 1873 telegraphic communication was established between Calmar and Bornholm. Population, 9000.

CAL MUCKS. See MONGOLIA and RUSSIA.

CALNE, a market-town and municipal and ancient parliamentary borough of Wiltshire, 30 miles N.N.W. from Salisbury, and 109 miles from London by the Great Western Railway, stands on the Calne brook, which, having received two small affluents above the town, is below it called the Marden, and flows into the Bristol Avon. The houses, which have been improved of late years, are substantially built of stone, and the streets are neat and clean. The town is supplied with water from wells. The manufacture of woollens, which was formerly carried on very extensively, is now extinct. The principal trade is the curing of bacon; there are also some flax and paper mills. Calne contains a town hall, a church, whose tower was designed by Inigo Jones, and which has been well restored; a free church, with tower and spire, erected in 1868; and places of worship for dissenters. There are also almshouses, a free grammar-school, and a school for 100 children, erected in 1861 at the expense of Mrs. Guthrie. The same lady founded a servants' training institution and a children's hospital. The literary institution possesses a free library. A branch from the Wilts and Berks Canal comes to the town, and it is connected by a branch railway to Chippenham. Calne was formerly a parliamentary borough and returned two members to the House of Commons from the time of Richard II. to 1832. It was then deprived of one, and ceased altogether as a separate borough after the Redistribution of Seats Act of 1885. The number of voters in 1885 was 916. The municipal borough consists of part of Calne parish only, and has a population of 2174. It is governed by four aldermen and twelve councillors. Roman remains have been found near the town; and it was the residence of some of the Saxon kings, but no traces of their palace exist. A synod, presided over by Archbishop Dunstan, was held at Calne in 977. In the neighbourhood are vestiges of a Danish camp, and 3 miles distant is the famous "white horse" of Wiltshire, cut into the chalk cliff. The work was executed in 1789 by Dr. Alsopp, and may be seen from a distance of 50 miles. Calne was at one time the residence of Dr. Priestley Bowood, the magnificent seat of the Marquis of Lansdowne, is about a mile from the town.

CAL OMEL. See MURRAY.

CALONNE, CHARLES ALEXANDRE DE, born at Donai in 1734. One of all statesmen and financiers probably the worst condemnation. It was his reckless folly which precipitated the French Revolution. He was, as Carlyle says, "of indisputable genius, even fiscal genius; more or less, of experience both in managing finance and parliaments, for he has been Intendant at Metz, at Lille king's procureur at Donai." With such antecedents Calonne succeeded, in 1783, the honest Necker as controller-general of finance under Louis XVI. Necker was dismissed in 1781 as unable to work with the other ministers - no great wonder! The interval was filled by Fleury and by D'Ormesson, quite unable to stave off the growing bankruptcy. With Calonne, however, things changed; money came in plentifully; debts were paid; loan after loan was readily filled. "I always thought that man would save France," said one of the great nobles, "but I never thought he would do it so soon." The crash came in three years; all money borrowable had been borrowed. Calonne also had to come to the king and cry for retrenchment. "Why, this is Necker over again!" exclaimed the disappointed Louis. Calonne proposed to revive the Assembly of Notables, an expedient unknown in France for 160 years. The Notables assembled on the 2nd of February, 1787, and it was then found that whereas in five years Necker had borrowed 17,000,000 francs, Calonne had himself borrowed in his three years of office the balance of nearly 1,250,000,000 francs. (The loans of Fleury and D'Ormesson were comparatively small.) The public annual

deficit was 115,000,000 francs. To his suggestions of taxation of all classes, even of nobles and clergy, the horrified (untaxed) assembly retorted by calling for accounts. No accounts were or could be prepared. Gamblers cannot keep books, and Calomne had been a gambler, trusting to some lucky venture to bring the crooked straight. His attitude before the bureaux was admired by all. For five hours he stood answering wittily and calmly an incessant fire of angry questions. His *sang froid* could not save him, however, from instant and ignominious banishment. A financier's widow in Lorraine, to whom he had been kind, offered him her hand and fortune in his disgrace, and he was thus saved from utter destitution. In after times he "shall be seen hovering on the Northern Border, seeking election as National Deputy; but sternly beckoned away." He took to intriguing for the exiled princes. Eventually, in 1802, he obtained permission at the hands of Napoleon I. to return to France to die.

CALOPHYLLUM (from Gr. *kalos*, beautiful, and *phyllon*, leaf), a genus of plants belonging to the order GUTTIFERA. They are trees, the leaves of which have numerous transverse parallel veins, which give them a very beautiful appearance. The flowers are polygamous, in panicles which are generally trichotomous. The ovary is one-celled, style long with a petate stigma, and one erect ovule. The fruit is an indehiscent drupe.

Caloph. Pum. Calophyllum is a tree 50 feet in height, a native of the East Indies. It has large handsome leaves, like those of a water-lily, snow-white fragrant flowers, and a fruit about the size of a walnut. The nuts afford a fixed oil (Pinney Oil), which is expressed and used for burning in lamps. The oil is also used externally for rheumatism. A resinous substance, resembling myrrh, is obtained from the bark, and is useful for indolent ulcers.

Calophyllum Calaba (Calaba tree) attains a height of 60 feet, and is a native of the Caribbe Islands. It has white sweet-scented flowers, and a green fruit something like the carolin cherry, which contains a white solid kernel. An oil is expressed from the seed for domestic uses and for burning in lamps. The timber is used for various purposes, especially for staves and clock headings. Dampier is said to have used the stems as masts.

CALORES'ENCE, the name given by Professor Tyndall to the production of light from the invisible rays by and the red end of the spectrum. These rays, though quite dark (to human eyes), are the hottest of all; and if coils filled with suitable media transparent to heat, but opaque to light, such as a solution of iodine, be placed in the path of a ray of light, the heat rays still pass, and may be brought to a focus. Magnesium is burned, platinum is raised to a white heat, &c. Calores'ence is defined by Professor Tyndall as the change caused by the intervention of the platinum, &c., raising the refringibility of the dark rays so as to render the non-visual visual ("Light," &c., London, 1882).

CALOR'IC. See HEAT.

CALORIMETER, an instrument for measuring the quantity of heat given out by bodies in passing from one temperature to another; that is, ascertaining what is called the *specific heat* of bodies. If 10 oz. of boiling water and 10 oz. of mercury at freezing point be added together the combined temperature will be 96°8. C.; that is to say, the mercury has risen by nearly 97° through the heat which the water has lost, though the water has cooled but little more than 3°. The specific heat of mercury is therefore 3·24 divided by 96°8, that is .033. Water is the standard, and its specific heat is 1. There are various forms of calorimeter; the simplest is that in which a tube full of the substance to be measured, raised to a known heat, is plunged into a like weight of water containing a thermometer. The exact precautions and calculations necessary for complete accuracy need not be detailed.

CALOTROPIS is a genus of shrubs or small trees belonging to the order ASCLEPTADEÆ. There are three species, natives of the warmer regions of Asia, and also of Arabia and tropical Africa. The flowers have a broadly campanulate corolla, with the five corona-scales adnate to the staminal tube, and recurved at the base.

Calotropis gigantea, a native of India and the Malay Archipelago, is a tree 15 feet high, with rose-purple flowers, and the segments of the corolla reflexed. This tree is common in sandy places in many parts of India, and is called in Hindu "Mudar," and in Tamil, "Yer-cum." It has a milky juice in its stem, which, as well as the bark of the root, enjoyed such reputation among the native practitioners as a medicinal agent as to lead to its use among European practitioners in the East. It was found to be very efficacious in the cure of many obstinate cutaneous diseases, such as lepra arabum and elephantiasis; in syphilitic complaints, also, and anasarca it proved so valuable an alternative, that it received the name of Vegetable Mercury. Some use the powder of the bark of the root, while others prefer the dried milky juice, which in a recent state, if taken in large quantity, is poisonous. It was thought to possess some specific quality; but Dr. Duncan, by whom extensive trials were made of it in Britain, showed that this is not correct, but that it is infinitely more valuable from its common medicinal properties, which correspond in every respect, according to him, both in kind and degree, with those of ipecacuanha. He even thought that, from the facility with which any quantity could be procured from Hindustan, the use of the Brazilian ipecacuanha might be altogether dispensed with in our East Indian settlements.

Besides its practical value as a medicinal agent, the bark of the root possesses the singular property in one of its constituents, *mudarine*, of being very soluble in cold water, gelatinizing when the solution is heated to 85° or 90° Fahr., and recovering its fluidity on cooling. It is the only instance known of any organic body being an exception to the general law of the power of solvents being increased by an increase of temperature. The mudar tree grows on hot dry sands where scarcely anything else can be cultivated. A blue like flax is obtained from the branches; it can be spun into the finest thread for sewing or weaving, and its tenacity is one-half greater than cotton.

Calotropis procera, a shrub from 6 to 10 feet high, has much the same properties. It is a native of India, Arabia, and Africa. The flowers are pale purple, and the segments of the corolla are spreading.

CALOYERS, the name given to the monks of the Greek Church (from a corruption of two Greek words, *kalos* and *geron*), and which signifies "good old men." They follow the order of St. Basil, and are divided into three ranks, the *Archari*, or novices; the *Microchemi*, or ordinary monks; and the *Megalochemi*, or more perfect monks. They have numerous monasteries, of which the most celebrated is that on Mount Sin, founded by the Emperor Justinian. On Mount Athos there are no less than twenty monasteries, the inmates of which enjoy a high reputation for sanctity. There are also convents of female Caloyers, who likewise follow the rule of St. Basil.

CALPENTYN (*Kalputti*), the name of a peninsula, gulf, and town on the west coast of Ceylon, in lat. 8° 14' N. and lon. 79° 53' E. The peninsula is about 40 miles long, very narrow, and generally very low; at high tides, during the north-east monsoon, it becomes an island. The soil is sandy but fertile. Great quantities of cocoa-nuts, excellent grapes, mangoes, citrons, guavas, and other Eastern fruits are produced.

CALPURNIA, or as Shakspeare ("Julius Cæsar") calls her, *Calpurnia*, was the last wife of Julius Cæsar. She was the daughter of L. Calpurnius Piso, and married Cæsar B.C. 59, when Pompey married Cæsar's daughter

Julia. Calpurnia was a woman of the highest character; and this fact, coupled with the other, that Cleopatra (come to Rome on some business connected with her kingdom), was her guest at the time of Caesar's murder, throws the greatest doubt upon the received popular account of the great dictator's amour with the "serpent of old Nile." [See CÆSARION.] Shakspeare has faithfully represented Calpurnia's tender solicitude for Caesar's safety. Dion Cassius ("C. Jul. Cæs." xlv. 17) relates that she saw her great husband lying murdered, in a vision, and afterwards dreamt that he ascended into heaven and was received by the hand of God. Yielding to her entreaties, and warned by unpropitious sacrifices, Cæsar determined not to go to the Senate on the fatal "Ides of March" (15th March), n.c. 44. But Decimus Brutus prevailed, and Cæsar met his fate. It is not recorded what became of Calpurnia.

CALUMBA ROOT of commerce is furnished by the plant called by botanists *Jateorhiza palmata*. The genus belongs to the order MENISPERMACEÆ, and contains two or three species, natives of tropical Africa and Madagascar. The flowers have six concave petals, each inclosing one of the stamens; the anthers open by transverse chinks.

Jateorhiza palmata is a native of the Mozambique and Quilimane countries of eastern tropical Africa. There is a short rootstock, from the under part of which descend several fleshy roots, from 1 to 4 inches in diameter, with a brown skin and yellow flesh. There are several slender climbing stems on each rootstock, which reach even to the tops of trees. The roots are called by the natives Kalumb, whence the name.

"Calumba root is a bitter stomachic and mild tonic. Its especial value as a tonic resides in the fact of its not producing nausea, sickness, febrile disorders, or headache, like other remedies of the class to which it belongs. It has been found of great value in general debility, gastric irritability, in allaying the vomiting frequently attendant on pregnancy, in atonic dyspepsia, and in the advanced stage of diarrhoea and dysentery, when the inflammatory symptoms have subsided. As it contains neither tannic nor gallic acid, it undergoes no change when combined with salts of iron and alkalies, and it may therefore be frequently advantageously prescribed in conjunction with them." (Bentley and Trimen's "Medicinal Plants.")

CALUMET, the name given by the North American Indians to a pipe for smoking tobacco. The following is a description of it:—"The calumet, or pipe of peace, is a large tobacco pipe, with a bowl of polished marble, and a stem 2½ feet long, made of strong reed, adorned with feathers and locks of women's hair. When it is used in treaties and embassies the Indians fill the calumet with the best tobacco, and, presenting it to those with whom they have concluded any great affair, smoke out of it after them." To refuse the calumet is a sign of hostility. It is offered to strangers as a mark of hospitality. To smoke the calumet of peace literally signifies, in the language of the North American Indians, "to be on terms of friendship and alliance."

CALVADOS, a department in France formed out of several districts of Basse Normandie. These districts are—Bessin, which extended between the Dive and the Vire, including the Bocage, the plain of Caen, and the territory of Bayeux; Auge, which comprised the valley of the Touque below Lisieux, and extended between the Touque and the Dive; and part of Lieuvin, to the south and east of Lisieux. The department is bounded on the north by the English Channel, on the east by the department of Eure, on the south by that of Orne, and on the west by that of Manche. It lies between 48° 46' and 49° 25' N. lat., 0° 26' E. and 1° 10' W. lon. Its greatest length, from east to west, is 65 miles, and its greatest breadth, from north to south, is 43 miles. The area is 2140 square miles, and the population in 1882 was 439,830.

The south-western angle of the department is crossed by the range of hills which separates the basins of the Loire and the Seine. The rest of the department consists of extensive plains, separated by low hills, and each drained by one or more rivers. The plains all incline from S. to N., and all the rivers fall into the English Channel. The coast, which extends from the mouth of the Seine to that of the Vire, is generally high and difficult of access. A ridge of rocks runs at a little distance from the shore, and parallel to it, for about 20 miles westwards from the mouth of the Orne. These rocks, which give the name to the department, were called *Calvados*, from a Spanish ship belonging to the Armada that was wrecked upon them in 1588.

The principal rivers are the Touque, the Dive, the Orne, and the Vire. All these are tidal rivers, and are navigable for several miles from the sea at high water; on the left of the embouchure of each, lighthouses are established. The department is crossed by ten governmental roads, and by the railway from Paris to Cherbourg and its branches. A canal runs from Caen to Ouistreham.

The department contains 1,372,394 acres, distributed among 167,605 proprietors, and subdivided into 1,142,252 parcels. All this surface, with the exception of a small portion of heathland, is productive. On the rich pastures great numbers of cattle and horses are reared. The system of green feeding is extending rapidly, and large numbers of cattle are fattened for the markets of Paris and the interior. The horses are of the true Norman breed, and much valued for their shape and serviceable qualities. The poultry of the department is abundant and excellent. Great numbers of capons are sent to Paris. Wheat, potatoes, and cider apples are grown in large quantities. Of cider, the annual produce is over 30,000,000 gallons. The best kind is that made in the Auge district; it contains a large proportion of alcohol, and will keep for years. Apples, haricots, onions, &c., are extensively cultivated. The department contains numerous wind and water mills, foundries and furnaces, and factories. Building stone, marble, slate, brick, potter's clay, and iron, are found. Mail abounds in the arrondissement of Lisieux and Pont-l'Évêque, and is used for manure. Coal-mines are worked at Littry, in which several steam-engines are employed.

The chief industrial products are cotton and woollen yarn, fine and coarse woollen cloths, linen, flannel, blankets, shawls, calicoes, lace, porcelain, and cutlery. The manufacture of lace alone gives employment to 50,000 persons, and the value of the goods annually exported amounts to many millions of francs. The department contains several paper mills, sugar refineries, tanneries, oil-mills, and establishments for the manufacture of chemical products and bleaching linen. The commerce consists of its industrial products, together with horses, fat cattle, butter, cheese, poultry, cider, honey, spirits distilled from cider, clover seed, hemp, wood, oil, &c. The imports are iron, wool, raw cotton, hides, and colonial produce. Great quantities of lobsters, oysters, and other fish, are taken along the coast and conveyed to the markets of Paris and of the interior.

The department is divided into six arrondissements, viz.—Caen (in which is situated the town of Caen, the capital of the department), Bayeux, Falaise, Lisieux, Pont-l'Évêque (containing Houlle, the chief port), and Vire. The climate, though variable, is healthy.

CALVIN, JOHN, one of the most eminent of the Protestant reformers, was born at Noyon in Picardy, 101st July, 1509. He was the second son of Gerard Chauvin, a notary apostolic and procureur-fiscal for the lordship of Noyon, who destined all his three sons for an ecclesiastical life. The young Calvin was trained in the first instance at his father's expense with the children of the noble family of De Mar-mor, and at the age of thirteen his father obtained for him a benefice in the Chapelle de Notre Dame de la Gère.

The income derived from this nominal situation enabled him to proceed to Paris, where he studied first at the College de la Marche under Maturin Cordier, but afterwards removed to the College Montaigne. At the age of nineteen he obtained the living of Martville, which he exchanged two years afterwards for that of Pont-l'Évêque, a village near his native place. He was not, however, destined to enter the priesthood, for soon after this his father changed his plans concerning him, and directed him to study with a view of entering the legal profession. This change was not unacceptable to the young Calvin, for he had been urged to the study of the Bible by the advice of a relative, Pierre Robert Olivetan, and had begun to entertain grave doubts as to many of the doctrines of the Roman Catholic Church. He accordingly resigned his living and repaired to Orleans, where he studied law under Pierre de l'Étoile, a famous teacher of the day. Here he laboured with so much zeal and success that he was often appointed to teach in the absence of his tutor, and on leaving Orleans he received the title of Doctor of Laws, without the usual fees. From Orleans he went to Bourges, where he continued the study of law under Alciati, and obtained a knowledge of Greek from Mechior Velmus, a learned and pious man, who also taught him the meaning of the New Testament. During the whole of this time he had also persisted in his theological investigations, with the result that he gradually abandoned Romanism and adopted the doctrines of the Reformation, which when accepted he began to teach, by private conversation and by preaching, in the surrounding villages. At this period his father died, and soon after Calvin removed to Paris, where he remained from 1529 to 1532. Here he continued his studies in divinity, and ultimately devoted himself wholly to them and to the work of teaching and preaching the doctrines of the Reformation in the French capital. In 1532 he published Smeac's "De Clementia," with notes and commentary, and he also prepared an address for his friend Nicholas Cop, which he, as agent of the Sorbonne, delivered on the festival of All Saints. This address was a full and able vindication of the reformed tenets that the doctor of it was obliged to flee from Paris to escape the anger of the Roman Catholic party, and Calvin also escaped with considerable difficulty to the court of the Queen of Navarre, by whom he was protected for a time. He afterwards returned to Paris, where he remained in concealment, though he challenged Servetus to meet him in controversy, and published a work, entitled "Psychologia," in 1534, at Orleans, directed against the "soul sleep" doctrine of the Anabaptists. He was again compelled to flee from Paris by the violence of the persecution there.

He succeeded in making his way to Basel. He was welcomed by the reformers, and commenced the study of Hebrew. Here he published, in 1535, the first edition

of his "Institutes of the Christian Religion." Francis I. of France had endeavoured to excuse his own persecution of Protestants, by declaring that his punishments rested only on men who were of bad character or who were the cause of sedition or political disorder, and it was this statement that Calvin used to excuse itself for shedding the blood of the true. "I said Calvin," moved me to publish my Institutes. The object of the work was to exhibit a full view and a vindication of the doctrines of the reformers, the preface taking the form of a remonstrance addressed to Francis I. A second edition in Latin was published at Basel in 1536. This work is a literary prodigy, whether considered as to style or substance, or to the influence it has exerted on the age that produced it, and on succeeding centuries. Written when Calvin was only twenty-five, and after but a few years of theological study, it is marked by such maturity of thought that in all the succeeding editions he never altered any essential point. From the influence it has exerted it must ever be regarded as one of the few books which have changed the face of society. Soon after the publication

of this work he paid a visit to the court of the Duchess of Ferrara; then he went to his native place to arrange his affairs, with the resolution of returning to Basel. But the ordinary route being very dangerous, "he must needs pass through" Geneva. There he was unexpectedly discovered and arrested by the intrepid Farel, originally a French nobleman, who, after many a hard struggle, had won Geneva to the Reformation, and who boldly laid the curse of God upon Calvin if he would not on the spot become his coadjutor. The pale and youthful stranger would have passed on, but "necessity was laid upon him," and he who entered the city as a casual visitor was induced at the age of twenty-eight to make it his abode—an abode which, pregnant with immediate results, has also given it undying historic eminence. Having accepted the task imposed upon him he at once threw all the energy of his character into the work before him, and to confirm the people of Geneva in the doctrines of the Reformation as opposed alike to Roman Catholicism and the fanatical teaching of the Anabaptists and others. Calvin, in union with Farel, drew up a Confession of Faith, in twenty-one articles, which all the citizens were required to sign. The Anabaptists were effectually silenced in a public disputation held on 18th March, 1537, and Calvin and Farel also obtained a victory over a reckless opponent named Peter Caroli, who had charged them with heterodoxy. Their efforts towards the reformation of the state of society at Geneva were, however, less successful, and their stringent regulations soon led to a reaction. They attempted to regulate dress and to control the fashions of private life. The fault lay in their identifying church with state, or in so incorporating them as to form a species of theocracy. The people in parties of ten swore to the reformed confession as citizens to a charter, and not as members of the church to a creed. Their orthodoxy did not amend their lives, or lead to that austere purity which their spiritual guides inculcated, expected, and exemplified. The people would not bend to the new authority, which in turn maintained its independence of all civil control. The council, without consulting Calvin and Farel, had accepted, through the influence of Berne, the resolutions of the Lausanne synod of 1537, and the pastors refused to administer the sacrament. The council resolved to prove its power, and a popular assembly convoked by its command ordered the preachers, 23rd April, 1538, to quit the city within two days.

The banished preachers retreated to Zurich, sojourning for a few weeks at Berne. They stated their case before a synod of Swiss pastors at Zurich, urged their willingness for a compromise in many things indifferent, such as the use of fonts and the observance of festivals, and obtained a favourable verdict; but the Bernese interfered, and a second edict of banishment was confirmed. Calvin next went to Basel, and thence to Strasburg. He seemed to feel his banishment from Geneva as a kind of relief, since it gave him leisure for theological study. But Bucer prevailed upon him to engage in active service, and he became pastor of a congregation composed of French refugees, and occasionally lectured also in the Academy. Here he put the finishing touch to the "Institutes," in a new edition issued in 1539, published his elaborate "Commentary on Romans," the result of his academical lectures, and also a tract in French on the Lord's Supper. At this time he married a widow, Idelette de Bures. The portions of his correspondence in which her name occurs, his references to her, and his poignant sorrow at her death, prove that he was not, as is often supposed, a dry and callous recluse, or an incarnation of polemical dialectics; but that, amidst all his cares and labours, he was endowed with many genial susceptibilities, though he was not forward to display them, and possessed not a few elements of tenderness and affection, though he was not addicted to a fond or frequent expression of them.

The people of Geneva soon found that they could not get on without a vigorous leader, and in 1551, disorders

having broken out, they sent Calvin a pressing invitation to return. At first he refused to comply, but on their repeated solicitations he returned in September of the same year and assumed the head of the government.

His labours now were incessant—preaching every day on alternate weeks, teaching theology three days every week, absorbed in literary work, engaged in an extensive correspondence, maintaining repeated controversies, and battling with fierce and vindictive opponents. The work of the day was often prolonged through a large portion of the night, so that he complained that he should soon not know the appearance of the sun, not having had time to look at it for many days. The rule which Calvin again established at Geneva was very rigorous, and there was often a recoil. It comprised all the citizens, not merely those who willingly and from conviction placed themselves under it. Non-attendance at church was punished by a fine, and adultery was made punishable by death; sumptuary laws of the strictest kind were enacted; brides, unless of unblemished character, were not allowed to wear wreaths; idle talk was under the cognizance of the police; gamblers were put in the pillory, and the manufacture of cards was forbidden. Those who approached the Lord's Supper without obtaining permission were punished, and those who neglected the opportunity might be banished for a year. An edict was issued that every one confined to bed with sickness for three days should give notice to the pastors. Torture was in use, though not in the trial of heretics, and wives were to be burned.

During this period Calvin became also engaged in numerous controversies. The first of these was with a Romanist named Pighius, who violently attacked his teachings as to free-will and predestination, but who was brought over by the arguments advanced by Calvin in his reply published in 1543. In 1551 he had to defend the same doctrine against Bolese, once a Carmelite monk, and now settled as a physician in Geneva. According to the custom of the times Bolese was banished, and he finally returned to the Roman Church, writing at his recantation a romance of slanders, which he called the life of Calvin—"Histoire de la Vie de Jean Calvin." Two years later occurred the memorable contest with Servetus which had so tragic an end. This unhappy man, after various wanderings, had been arrested and condemned for heresy at Vienna, but had contrived to escape and to make his way to Geneva. It was his intention to proceed from thence into Italy, but he was arrested by the order of Calvin and conveyed to prison on the charge of blasphemy. This arrest was founded on certain statements contained in his book entitled "Christianismi Restitutio," in which he reflected on the doctrine of the Trinity, and advanced views of a pantheistic character. The trial lasted two months, Calvin appearing as his accuser, and the controversy being carried on with great ability and intense bitterness on both sides. On the 25th October, 1553, sentence was pronounced, and Servetus was condemned to be burned to death, and this horrible punishment was inflicted at Champel, near Geneva, the following day. Many attempts have been made to clear the character of Calvin from the stain of this transaction, but after all has been said the facts remain that it was by his instigation that Servetus was arrested, that on his trial he was assailed by Calvin with the utmost vehemence, that Calvin declared him worthy of death, and approved the passing of a death sentence and its execution. On the other hand it must be admitted that there is no reason for believing that he was actuated in what he did by any private spite or animosity against Servetus; that he sought to change the mode of his execution from that of fire to beheading; and lastly, that it was a general opinion then, both among Catholics and Protestants, that obstinate heresy or blasphemy was deserving of death. The practice of the Romanists is too well known to need further reference, and among Pro-

testants even Melancthon could justify such proceedings. Servetus himself, in the very book for which he was condemned, urged that blasphemy should be punished with death. Two years after the death of Servetus the party of the Libertines was finally conquered and its leaders banished from Geneva, after which Calvin remained supreme in authority until his death. He used his power vigorously in the interest of Protestantism, and under his sway Geneva became the spiritual metropolis of the reformed churches. All the while he lived in frugal simplicity, and was suffering under a terrible complication of maladies. Asthma, hemorrhoids, gout, stone, and fever tormented him. Frequent headaches led to as frequent fastings to relieve them; nocturnal study was carried on with the aid of a dim lamp suspended from a corner of the humble bed on which he lay, so that his frail body was wasted and worn away by the early part of the year 1564. He delivered his last discourse on the 6th of February in that year. Several months more he survived in agony and weakness, and his words and exercises on his deathbed betokened his fatigues and resignation. When the members of the council obeyed his summons and came into his room, he spoke to them of past mercies and jeopardies, and asking their pardon for the trouble he had given them, and for any outbreaks of hasty temper he had manifested among them, and then offering a fervent prayer for them, he solemnly gave his right hand to each as he said farewell. He died on the 27th of May, 1564, at the early age of fifty-five. No stone was set to mark his grave—such had been his request in his testament.

As Luther was the creator and Melancthon the scholar, so Calvin was the divine and dialectician of the Reformation, systematizing its doctrines, and organizing its ecclesiastical discipline. Possessed of a clear, penetrating, and powerful understanding, a memory of extraordinary tenacity, and wide and varied learning, he added to these a firmness and inflexibility of purpose which no opposition could overcome and no vicissitude shake. His system of theology is compact and logical in all its parts—a powerful reproduction of that of St. Augustine. His numerous commentaries, though of unequal merit, display great acuteness and learning, excelling more in tracing the course and development of thought than in the analysis of ideas and phrases—and they are as concise and simple in style as they are clear, judicious, and discriminating in matter.

According to Boza's description, Calvin was not of large stature; his complexion was pale, inclining to brown, and his eyes were of peculiar brightness and penetration. He took little sleep, and often ate only one meal a day. He had amazing facility in recognizing people when he had but once seen; and amidst great and serious enterprises he never forgot the more trifling minutiae of daily business.

Calvin's works have been often printed, at least many portions of them, both in French and Latin. His complete works appeared at Geneva in 1578, in twelve vols. folio, and another edition at the same place, in seven vols. folio, in 1617. They were again reprinted at Amsterdam in 1671, in nine vols. folio. They were collected, translated into English, and published at Edinburgh by the Calvin Translation Society, in fifty-one vols. 8vo (1843-55). Tholuck has edited his Latin commentaries on the New Testament. Beza wrote his life, and in an augmented form it often stands as a preface to the exposition of Joshua. Portions of autobiography are found in the preface to his "Commentary on the Psalms." There is also an elaborate life of the reformer by Henry, "Das Leben J. Calvins," three vols. 8vo (Hamburg, 1835-44), an English translation of which, by the Rev. H. Stebbing, has been published in two vols. 8vo.

CALVINISM, the system of religious doctrine maintained by Calvin and his followers, as distinguished from the Lutheran and Anglican.

Calvin, as we have seen in the previous article, published

his system in his "Institutio," but it does not appear to have obtained the name of Calvinism, nor its supporters the name of Calvinists, till the Conference of Poissy in 1561. In the debate which there took place on the Augsburg Confession, the points of difference between the followers of Luther and Calvin were brought out; but it was not until after the rise of ARMINIUS that Calvinism became fully marked off as a distinct doctrinal system.

The modes of thought indicated in the opposing systems of Arminianism and Calvinism found expression in the Christian Church at a very early period, the latter consisting almost entirely of a revival of the teachings of Augustine in his controversy with Pelagius. The chief distinguishing features of Calvinism are to be found in its doctrines as to original sin, predestination, and irresistible grace. With respect to the first of these, it maintains that Adam was originally created pure and holy, but when he fell from this state he involved all his descendants in the consequences of his fall and in ruin, inasmuch as they must all be born sinners, corrupt in themselves and liable to condemnation. From among these God has, in the exercise of free grace, chosen out a certain number for salvation. These all receive in due time an irresistible call to repentance and faith in Christ, and are further so preserved by divine grace that they cannot altogether fall away, but are assured of ultimate felicity. These are termed the *elect*, the other portion of mankind, for whom no such provision is made, and who in consequence are destined first to sin in this life and to eternal death hereafter, being termed the *reprobate*. Other leading principles of the system are the spiritual presence of Christ in the eucharist and the independence of the church. Calvinism was perhaps, like Lutheranism, exemplified first at Strasburg, but it was at Geneva that the system attained its full vigour. From thence it spread into France, Germany, Prussia, the United Provinces, England, and Scotland, and then to America. The Established Church of England, for a considerable period after the Reformation, was Calvinistic in its theology, but after the victory gained by the High Church party over the Puritans, Arminianism gained the ascendancy. The Presbyterian Churches of Scotland, and those of England and America, have for the most part remained steadfast to Calvinism. The Baptist Churches of England are also chiefly Calvinistic in doctrine, the different societies of Methodism, and a number of the Congregational Churches, being Arminian.

CALYCANTHACEÆ is an order of handy plants, well known in gardens for the delicious fragrance of their blossoms. They are in some respects allied to the magnolia, or star-anise plant (*Illicium*), in consequence of their chocolate coloured flowers having the segments overlapping each other in several rows, and because also of their peculiar fragrance; the tubular receptacle inclosing the calyx recalls the *Besleria*, but some of the stamens are situated outside the tube. There is no albumen in the seeds, and the cotyledons are convolute.

Calycanthaceæ is placed by BENTHAM and HOOKER in the order RUTACEÆ, among the POLYTRICHALES. The order consists of but two genera, *Calycanthus* and *Chimonanthus*. The genus *Calycanthus* (the Carolina allspice) consists of small shrubs, natives of North America, with fragrant chocolate coloured flowers, appearing along with the leaves in May or June. *Chimonanthus* (the Japan allspice), but one species, which is found wild in Japan, and has fragrant lemon coloured blossoms, which appear in the winter, after the fall of the leaves.

CALYCERÆÆ, a small order of GASTROTRICHALES, differing from COMPOSITE in nothing but their seeds having albumen and being pendulous, and in their anthers being only half syngeous. There are twenty species placed in three genera, all found in temperate South America, and one species extending to tropical Brazil.

CALYCIFLOREÆ, an artificial division of polypetalous dicotyledonous plants, proposed by JUSSIEU and adopted by DE CANDOLLE, and partially by BENTHAM and HOOKER. It is characterized by the stamens adhering more or less to the side of the calyx, or being perigynous. See BOTANY.

CALYDON was a town in ancient Ætolia, on the northern shore of the Corinthian Gulf. Mr. Swinburne's magnificent poem, "Atalanta in Calydon," has celebrated the great myth which clings for ever round the town—the hunt of the Calydonian boar. This terrible animal Artemis had sent to ravage Calydon, because Æneus, its king, had refused to sacrifice to her. MELEAGER and a group of heroes, with whom the maiden Atalanta also went, succeeded in destroying the boar. It is perhaps worth notice that this myth is sometimes incorrectly alluded to as that of the *Caledonian* boar. When Augustus founded Nicopolis, in commemoration of the victory of Actium, he removed the whole population of Calydon thither, *n.c.* 31.

CALYPSO (or more properly *Kalypso*), the unfortunate nymph who was mistress of the island of Ogygia, forms part of the great Odyssean myth of the Greeks. She seems to have borne Odysseus (Ulysses) a sincere affection. When he was shipwrecked on her island she received him with the greatest kindness, soon ripening into passionate affection. She promised to endeavour to secure him immortality if he would remain with her for ever, but after seven years of his companionship the gods compelled her to yield to his prayers, and let him continue his journey to Ithaca. Calypso was an Oceanid, or daughter of Oceanus, according to all the poets but Homer, who makes her a daughter of Atlas. The opening words of Télémaque, "Calypso ne pouvait se consoler du départ d'Ulysse," are probably familiar to most readers. Fénelon very ingeniously first introduces Télémaque on Calypso's island, in the long quest after his father which is the subject of his famous prose epic.

CALYPTRA, a name given in botany to a hood-like structure connected with the spore-cases of Muscinæ. In mosses it is carried up on the top of the urn, on the lengthening of the seta. In *Juncemammia* it exists in the form of a cup or wrapper at the base of the fruit-stalk, which, instead of carrying it up upon its point, pierces through its apex and leaves it behind.

CALYPTRÆIDÆ is a family of molluscous animals belonging to the order GASTROPODA, to which the name "bonnet-limpets" is sometimes given. In this family the shell resembles that of the LIMPET; it is destitute of an operculum, and the apex is more or less spiral, and in the young shell regularly so. The aperture is wide, and the interior is in some species furnished with a shelly process, variously shaped, and to which the adductor muscles are attached. The animal has a distinct head, with a lengthened muzzle, and the eyes are at the outer bases of the tentacles. In some species the animals carry and latch the spawn under the neck in front of the foot. The eyes are inclosed in a thin membranous bag in small groups, and the mother appears literally to sit upon and latch the eggs. She disposes them under her belly, and preserves them, as it were, imprisoned between the foot and the foreign body to which she adheres, her limpet-like bell thus serving not only to cover and protect herself, but as a shield to her offspring. The young are developed under this kind of maternal roof, and do not quit it until they have strength to attach themselves to the rock, and until their own shell is hard enough to afford protection when so attached. The species are numerous, about 110 having been described, and they are world-wide in their distribution. They are found adhering to stones and shells. "The animals of most of them," says Woodward, "appear never to quit the spot on which they first settle, as the margins of their shells become adapted to the surface beneath, whilst some wear away the space beneath

their foot, and others secrete a shelly base. Both the form and colour of the shells depend on the situation in which they grow. Those found in the cavities of dead shells are nearly flat, or even concave above, and colourless. They are presumed to feed on the sea-weed growing around them, or on animalcules."

Several species of this family are figured in the *Plates Gasteropoda*. The species of the genus *Calyptrea* (Plate III., figs. 14, 15), or "cup-and-saucer limpets," are found under stones, between tide-marks, and in shallow water. The shell is conical, the apex posterior, with a minute spiral nucleus. *Crucibulum* (fig. 16) is a sub-genus of *Calyptrea*, from which it differs in being less widely distributed, and being found adhering to shells.

In the genus *Crepidula* (figs. 12, 13), or "slipper shells," the shell is oval, and the shelly process covers the posterior half of the elongated aperture. About forty species have been described, the greater number of which are natives of America, though several are inhabitants of Australia, the West Indies, the Mediterranean, China, and Senegal. They are sedentary on stones and shells in shallow water, and, according to Adanson, seem to prefer those places where the sea beats with the greatest violence. They are often found adhering to one another in groups of many successive generations.

In the genus *Pileopsis* (figs. 1-4), to which the name "bonnet-limpet" is sometimes restricted, the shell is conical, with a posterior, spirally recurved apex; the aperture is round and expanded. The animal is rather sluggish and sedentary, and sometimes secretes an imperfect shelly plate from its foot. The species figured *Pileopsis hungaricus* is found on oysters. The name *Capulus* is sometimes given to this genus.

In the genus *Hipponyx* (figs. 5-9) the foot of the animal secretes a shelly plate, which is adherent by its outer surface to living shells and other marine bodies, and leaves an impression of a horseshoe shape. The shell is thick, obliquely conical, with a posterior apex. The sub-genus *Amalthea* (figs. 10, 11) is like *Hipponyx*, but secretes no shelly plate. It is often found on living shells.

The *Calyptæidæ* are found fossil, though but scantily, in beds of the secondary formation. They are more plentiful in the tertiary strata. The fossil *Platyceras*, dating from the Devonian beds, is sometimes referred to the genus *Pileopsis*.

CALYX, the external wrapper of a flower within the bracts. Usually it is green and leaf-like; sometimes, however, it is coloured like a corolla, from which it is only known by its being the outermost of the rows of floral envelopes. It consists of leaves called sepals, which are sometimes separate, when the calyx is polysepalous, and sometimes united into a sort of cup by the edges, gamosepalous (or monosepalous). Occasionally it is converted into feathery or short divisions, when it is named pappus; or it is altogether reduced to a small rim, so as to be hardly visible. In some plants it grows to the sides of the ovary, and is technically called superior, while it is named inferior if it is quite separate from that part. The calyx is sometimes coloured, as in *Fuchsia*, when it is called petaloid, and in this case, especially in monocotyledons, the calyx and corolla together go by the name of perianth. If it remain, as in the strawberry, till the fruit is ripe, it is persistent; and if it increase at the same time, as in many *Ebenaceæ*, it is said to be accrescent. The way in which the sepals are folded in the bud is noticed under *ÆSTIVATION*.

CAMAL'DOLITES, a religious order founded by St. Romuald, a Benedictine monk, at the beginning of the eleventh century. The first establishment of the order was in the vale of Camaldoli, in the Apennines. The Camaldolites have convents in various parts of Italy, mostly in secluded and elevated situations, whence they

have spread into France, Germany, and Poland. They wear a white garment, and their monastic rule has always been characterized by excessive rigidity. Except as showing to what extremes man can go in the way of mortifying the natural life, they have been practically useless in the world, and the order is now almost extinct.

CAMARINA, a town in the south of Sicily, on the river Hipparis, near the sea. Camarina was a Dorian town (Thucyd. iii. 86), the most considerable of the Syracusan colonies; founded B.C. 600, 135 years after the foundation



Coin of Camarina in British Museum—silver (actual size).

of Syracuse by Corinth. The situation was unhealthy, owing to the neighbourhood of a marsh which was formed by the river Hipparis. Only a few ruins now remain. After many reverses Camarina was taken by the Carthaginians, B.C. 404. The coins of Camarina are of superior execution.

CAMBACÈRES, JEAN JACQUES RÉGIS DE, an eminent French statesman and juriscounsel, was born at Montpellier, 18th October, 1753. He was elected deputy to the Legislative Assembly in 1791, and afterwards to the Convention in 1792. He at first opposed the trial of the king, but when it was decided on he voted against him, though he moved for delay in the execution of the sentence until the country should be actually invaded. After the fall of Robespierre he became president of the Assembly and of the Committee of Public Safety, in which capacity he assisted in bringing about peace with Prussia and Spain. He was made minister of justice under the Directory, assisted in the revolution of the 18th Brumaire, and became one of the most useful and faithful adherents of Napoleon, by whom he was made high chancellor of the empire, and in 1808 Duke of Parma. He took an important part in the compilation of the Code Napoleon, firmly opposed the murder of the Duc d'Enghien, advised Napoleon against the divorce of Josephine and the Austrian alliance, and endeavoured in vain to dissuade him from the invasion of Russia. In 1814 he voted for the abdication of Napoleon, but during the Hundred Days was appointed minister of justice and president of the Chamber of Peers. On the final return of Louis XVIII. he was banished as a regicide, but in 1818 was restored to all his civil and political rights. He returned to Paris, where he lived in retirement until his death, 5th March, 1824. Among the leaders of the Revolution he ranks as one of the ablest, mildest, and most useful.

CAMBAY (*Khanbhat*), a feudatory state within the political agency of Kaira, in the province of Guzerat, Bombay, lying at the head of the gulf of the same name, on the western shore of the province of Guzerat. The area is 350 square miles, and the population 175,000. The boundary line of the state is very irregular, and some villages belonging to the Gackwar of Baroda, and to the British government, are entirely surrounded by Cambay territory. The country is flat and open, interspersed here and there, generally in the vicinity of the villages, with groves of the trees, such as the mango, tamarind, baman, or *bar, m. c.* and *pipal*. Towards the north and west the soil is generally black, and well suited for the cultivation of wheat and cotton. To the east it is fit only for the growth of inferior sorts of grain, abundant crops of which are grown in

favourable years. Near the city of Cambay, skirting the shore of the gulf, and along the banks of the Mahi and Sabarmati rivers, stretch vast tracts of salt marsh land submerged at high tides. The chief articles of manufacture are—indigo, salt, cloth, carpets, embroidery, and carved camelans. Being within the influence of the sea-breezes, the climate of Cambay is generally milder and more equable than that of the interior of Guzerat. The most prevalent diseases are fever and dysentery. The average yearly rainfall is 29.30 inches.

CAMBAY, the chief town of the above state, is situated at the head of the Gulf of Cambay, on the north of the estuary of the river Mahi; and has a population of 35,000. The palace of the Nawabs is in good repair, but built in an inferior style of architecture. Many ruins still attest the former wealth of Cambay. It is mentioned, under the name of *Cambat*, as a place of great trade by Marco Polo, and by his countrymen and contemporaries. *Marine Samudra*, is one of the two great trading ports of India (Cambeth). Its commercial decline is attributable, in great measure, to the silting up of the Gulf, and also to the "ber" formed here in the north of the gulf, and at the entrances of the Mahi and Sabarmati (*Sacaramati*) rivers. High tides rise and fall as much as 33 feet, and the velocity of the current is from 6 to 8 knots an hour. In ordinary springs the rise and fall is 25 feet, and the current runs from 4½ to 6 knots. Great damage is thus frequently caused to shipping, the more so as the average depth of the channel is only from 4 to 6 fathoms; and the hazard is greatly increased by the constantly shifting shoals, caused by the frequent inundations of the rivers.

CAMBAY, GULF OF, the strip of sea which separates the peninsula of Kathiawar from the northern Bombay coast. The gulf was, in ancient times, a great resort of commerce, and much frequented by Arab mariners. The once famous harbours *SURAT* and *BROACH* have ceased to be used for foreign commerce.

CAMMING OUTAN (*Antelope sumatrensis*) is an ANTILOPE inhabiting the hilly forests of Sumatra. The horns are about 6 inches in length, slightly curved backwards, broad below, and sharp at the apex. The body is stoutish, and clothed with a long deep brown-colored hair, approaching to black, except on the back of the head, neck, and shoulders, and inside of the ears, where it is quite white; the mane is well developed and the tail moderately long. The habits of the camming outan are wild and restless, resembling in this the ibex, of which it has the roving, fearless eye and bold undaunted bearing. It is extremely active and swift-footed.

CAMBIUM-LAYER, in botany, is a term applied to those cells in dicotyledons and conifers which are situated between the layer of cork (*phloema*) and the wood (*xylem*). These cells have very thin walls, are full of sap, and by their multiplication form permanent cork cells on the outside, and wood cells towards the interior.

CAMBOGE. See GAMBOUT.

CAMBORNE, a large market town of Cornwall, 12 miles W.N.W. of Falmouth, and 312 from London by the Great Western Railway. It stands on an elevated site in the midst of the tin, copper, and lead mining district. Duloeath Copper Mine in the parish, is 1000 feet deep. The town is mostly built—many of the houses being modern. The church is a fine specimen of the granite churches of the county, and is constructed in the perpendicular English style. There are also a chapel of ease and places of worship for various denominations of dissenters. Camborne was the birthplace of Joshua Cristall, one of the founders of the Water Colour Society, and an accomplished artist; he was born here in 1767. Penponds, close by, was the native place of the engineer Richard Trevithick, inventor of locomotives for railways, whose system was adopted and applied by George

Stephenson. Trevithick was also engineer of the first Thames tunnel; and it is to him and Watt that we owe the practical application of the steam-engine. The population of the parish is 13,601. Camborne signifies "the crooked river."

CAMBRAI, a fortified city in the department of Nord, in France, stands on the right bank of the Escaut (Scheldt), 19 miles S. of Douai. In the later period of the Roman empire it was named *Cambracum*, and was one of the capitals of the Nervii, *Turnacum* (Tournay) being the other. Charlemagne fortified the town, and Charles le Chauve ceded it to its bishops, who long retained sovereignty over it. In 1508 the famous league against the Venetian Republic was entered into here. It was here also that a treaty of peace between Charles V. and Francis I. was signed, sometimes called the Ladies' Peace, from the circumstance of its being negotiated by the mother of the latter monarch and the aunt of the former. In 1533 the Emperor Charles V. took Cambrai, and erected the citadel on a height at the eastern extremity of the city. The fortifications were much strengthened by Vauban. The English took the town by escalade in 1815, and made it their headquarters during the campaign.

The city is large; the streets are wide and now pretty well laid out; the houses are well built—many of them are old, and present their gable ends to the street. The town is entered by four gates, and is surrounded by thick walls, surmounted at intervals by towers. The extensive square called Place d'Armes is capable of containing all the garrison drawn up in order of battle. The city contains some fine buildings, the most remarkable of which is the cathedral, erected on the site of an earlier church, which, together with other parts of the city, suffered great damage during the Revolution of 1793, and again by fire in 1859. It contains a monument to Fénélon, once the archbishop here, whose tomb was ransacked by the Revolutionists and his leaden coffin converted into bullets. Other buildings are the Church of St. Gery, the public library, which contains 30,000 volumes, besides a large number of manuscripts; the hotel de ville, a modern structure, erected in 1873 in place of the old building; the hospital; the theatre; and the palace of the archbishop. Among the literary establishments of the town are a college, a school of anatomy, two ecclesiastical seminaries, and several learned societies. Tribunals of first instance and of commerce are held. The see of Cambrai dates from the fifth century.

Cambrai is favourably situated for trade, in consequence of its position on the Escaut, which here commences to be navigable, and the canal of St. Quentin. The chief manufactures are cambric—so called from the name of the town, and for which it has long been noted—lawn, linens, thread, and cotton yarn, lace, hosiery, fine muslin, leather, black soap, starch, beet-root sugar, beer, brandy, salt, and salt-petre. The commerce of the town consists of these articles, and of corn, wine, wool, iron, cattle, coal, hops, and butter. The population in 1883 was 20,500.

CAMBRIA, an ancient name of Wales, from *Cymri*, as the inhabitants call themselves.

CAMBRIAN PERIOD is one of the subdivisions of the older Palæozoic. Although the term Cambrian, as used by most writers, is applied to these lowest fossiliferous rocks, yet the exact upward limit of the period is considered differently by them. Professor Sedgwick employed the term Cambrian for the older rocks of the North of England, and adopted that of Cambrian (proposed by De la Beche) for their equivalents in Wales to the top of the Bala beds; but Murchison restricted this latter term to the lowest members of the series. Various modifications in the classifying of the older Palæozoic have since then been proposed, the most natural being that in which marked unconformities separate the periods.

The Cambrian period, as here considered, extends from

the lowest beds of the Longmynd and Harlech group to the top of the Tremadoc slates. As thus applied we find the representative rocks in Sutherland to be unfossiliferous red conglomerates, resting on the denuded edges of pre-Cambrian metamorphic rocks, presumably of Laurentian age, and succeeded unconformably by Cambro-Silurians; near St. Davids, in Wales, equivalent rocks occur in an analogous position, but here they consist of slates, shales, and grits, some of the beds being highly fossiliferous. As exposed in other areas the base of the Cambrians is not seen, but they are overlaid unconformably by Cambro-Silurian or newer strata.

The fauna of this period, although not large, is of high organization for a primitive fauna, and is very distinctive; it is divisible into two distinct stages, hence the beds may be conveniently separated into Lower and Upper Cambrians.

In the Cambrian rocks of Wicklow and Westford we find what are probably the earliest fossil forms (if we except the doubtful *Eozoon Canadense* of Canada), the remains of a Sertulian zoophite, *Oldhamia*, of which three species have been described, also the casts of a worm *Histioceras Hibernicum*. In rocks of this age of Longmynd (Shropshire), worm-burrows and an ancient Trilobite, *Palaopogon*



Oldhamia antiqua.



Palaopogon Ramsayi.

Ramsayi, have been found. Amongst the lowest beds of the series at St. Davids, crustaceans of the genus *Leperditia*, and the two Brachiopods *Lingulella jerrypina* and *Lingulella primæva*, occur. Higher up in the series are sponges (Protospongia), several genera of Trilobites, and a Pteropod—*Theca antiqua*. In the Menevian beds, besides new species, there are several additions to the genera of Trilobites and Brachiopods, and the Cystideans have their first representative—*Protocystites Menevianus*. In the Lingula flags there is a great increase in the fauna, both specifically and generically, especially among the Trilobites; the Phylloporeri—*Hyomenus arviculatus*, and the Brachiopod *Lingulella Durisii*, are characteristic of these and the next succeeding beds; the genus *Orthis* appears here. In the Tremadoc slates of Ramsey Island several important groups appear: Lamellibranchiata are represented by the genera *Palaæra*, *Glyptaera*, *Davidia*, and *Modiolopsis*; Cephalopods by *Orthoceras sericeum* and *Cyrtoceras præcox*; a starfish, *Palæstina Ramsayensis*, and Encrinites have also been found.

This brief enumeration of the more important peculiarities of the fauna shows how varied and highly organized it must have been; but that the rocks containing these remains were derived from pre-existing sedimentary rocks is abundantly proved by the contained fragments; thus, at Llanberis, in some of the lowest beds, water-worn pebbles not only of jasper and greenstone occur, but also of quartzite and black and purple slate.

The Lower Cambrian consists of the Longmynd and Harlech group (which are about 8000 feet thick) below, and Menevian group (about 600 feet thick) above. The genus of Trilobites, *Paradoxides*, is very characteristic of this division, also *Microdiscus* and *Cencoryphe*. Beds of this age occur in Anglesey, where they are metamorphosed;

and in Merionethshire, Shropshire, and Carnarvon, where the Penryn slate quarries are worked in some of the upper beds.

The Upper Cambrians are represented by the Lingula flags (which are about 5000 feet thick) below, and the Tremadoc slates above (about 1000 feet thick); the Trilobites *Sao*, *Agnostus*, and *Olenus* are the most characteristic genera. The beds are exposed in Wales, being best developed towards the south. During the Cambrian period it is supposed the land surface, from which the red rocks were derived, lay to the north-west; and it is generally conceded that the rocks of this age in Scotland were deposited in an inland lake, while those of Wales and Ireland were deposited in an open sea; however, Sir A. C. Ramsay is of opinion that the Welsh rocks were deposited in a shallow, fresh water, subject to influxes of the sea.

The Primordial Silurian of Bohemia and of America is equivalent to these rocks.

CAMBRIDGE, a parliamentary and municipal borough and the county town of Cambridgeshire, is about 48 m. N. by E. from London, direct distance, and 57 by the Great Eastern Railway. There are also branches from the Great Northern, North-western, and Midland systems. It is a market-town, and the seat of a famous university, and is situated on the eastern side of the river Cam, except a small part which is extended over the bridge to the north-west. The recent name of the Cam was the *Granta*, and the Romans had a town called *Granta* on or near the present site of Cambridge, which in Domesday Book is written *Grantbrig*. The place suffered much from the Danes; it was at different times plundered, burned, and occupied by them. William the Conqueror, while the Saxons under Harold Godwinson held out against him in the Isle of Ely, built a castle here, the gateway of which remained until a comparatively recent period.

Henry I. granted the town a charter, which was confirmed by succeeding monarchs, and many privileges were accorded, especially by John, Henry III., Edward II., and Richard II. It was taken by the barons in 1213. In 1388 Richard II. held a Parliament here. During the civil war in the reign of Charles I. Cambridge was garrisoned by Cromwell (1643), and held for the Parliament, although many of the colleges were in favour of the king and assisted him by gifts of plate. Cromwell had previously twice represented the borough in Parliament, which from the time of Edward I. until 1885 returned two members. It was then deprived of one. Two also sit for the university. The corporation comprises a mayor, ten aldermen, and thirty councilors.

Cambridge is situated in a plain, and the surrounding country is flat. The general appearance of the town has been much improved of late years by the demolition of old and wretched tenements, and the erection of better houses on their sites. Several new public buildings have been erected; shops, banks, offices, and hotels have been constructed or rebuilt of a more ornamental character than those they displaced; and the university buildings and colleges have undergone a very general process of renovation, rebuilding, and extensive, the demand upon the university having for a long time exceeded the accommodation. The drainage has also been improved, and in 1869 the river Cam was closed and deepened for a distance of 3 miles. The river is crossed by many bridges, the principal one being an iron bridge, of one arch, connecting Bridge Street with Ely Road. The river is navigable up to Cambridge. The fine thoroughfare known as Trumpington Street contains the principal colleges. The grounds of those on the west side are skirted by the river, which adds much to their beauty. The chief trade of the town is naturally in connection with the university, and it has therefore not only to be provided with an abundant supply of provisions, but also with articles of necessity, taste, and

luxury demanded by the students. It possesses several breweries, flour-mills, and rope and brick works, also iron and brass foundries, and a tobacco manufactory, and carries on a trade with Lynn in coal, timber, &c. A curious custom prevails of making butter up in pounds each a yard or so long. There are extensive nurseries in the neighbourhood. Cambridge is divided into four parishes, and of the numerous churches belonging to the establishment, the most interesting are—Great St. Mary's, the church of the University; St. Sepulchre's, built in imitation of the Holy Sepulchre at Jerusalem, and one of the four in England possessing a round tower; and St. Benedict's. All Saints, an ancient structure, was removed from its old site, and rebuilt in 1861. There are also chapels belonging to the Baptists, Wesleyans, Congregationalists, Roman Catholics, and the Society of Friends; a free library, a guild-hall, an excellent free grammar-school, founded in 1615 by Dr. Perse—a theatre, a school of a working men's college. A corn exchange was erected in 1870. Among the numerous of notable institutions of the town the principal is the general hospital. It was founded by Dr. John Addenbroke, and is usually called by his name. It was opened for patients in 1766, and the old and dirty edifice in which it was long held was replaced by a new and very noble building in 1860. An old conduit in the market place was destroyed in 1614 by Hobson, the eccentric carrier, who also bought in 1628, a wool house, commonly called the Sowing House, now converted into a reformatory for paupers. The other chief buildings are mentioned in the article CAMBRIDGE, UNIVERSITY OF. Parker's Piece is a large cricket and playing ground for the use of the public. Cambridge is the title of duke to George, prince of the blood royal. The population of the borough in 1881 was 40,878.

CAM BRIDGE, a town in Massachusetts, in the United States of North America, on the river Charles, 8 miles N.W. of Boston, and 10 miles S.W. of Chelsea, with Chelsea, and Cambridge, two towns. The town was settled in 1630, and is one of the oldest of New England, and was named a few years later to its present name, in honor of the English university. The present Lexington and Andover, and other of the city of Boston, were formerly included in the Cambridge settlement. Cambridge was incorporated as a city in 1846; the city of Harvard University, formerly called Harvard College, founded in 1638, and the first teaching in the present college in the United States. A Cambridge the first president of America was elected in 1789, and in the year of his presidency with Great Britain, the first American army formed a camp here. The population of the city in 1880 was 22,936.

CAM BRIDGE, UNIVERSITY OF. Cambridge is supposed to have been a seat of learning in the sixth century. The first college known to have been granted to the university is St. Henry III. (1209). Charters were granted by Edward III. and Henry VIII.

The University of Cambridge is a society of students in every of the liberal arts and sciences, incorporated (Statute 29) by the charter of "The Chancellor, Masters, and Scholars of the University of Cambridge." This commonwealth is a union of seventeen colleges, or societies, devoted to the study of learning and knowledge, and for the better support of the church and state. All these colleges have their origin since the beginning of the reign of King Edward I., and are sustained by the endowments of their founders and benefactors. Each college is a body corporate, and has its own statutes; but is likewise controlled by the powers and laws of the university. The present university statutes were confirmed by Queen Victoria, by order in council, 31st July, 1858. They are the foundation upon which the colleges are framed. Colleges and halls are synonymous here, though not so at Oxford.

Each of the colleges, or departments, in this literary republic furnishes members both for the executive and legislative branch of its government. The place of assembly is the Senate-house.

The following is a list of the colleges, with the date of the foundation of each:—

1. St. Peter's Col., . . . 1257	10. Jesus College, . . . 1496
2. Clare Hall, . . . 1326	11. Christ's College, . . . 1566 and 1505
3. Pembroke Col., . . . 1347	12. St. John's Col., . . . 1511
4. Gonville and Caius College, . . . 1348	13. Magdalene Col., . . . 1519 and 1512
5. Trinity Hall, . . . 1350	14. Trinity Col., . . . 1516
6. Cor. Christi Col., . . . 1351	15. Emmanuel Col., . . . 1581
7. King's College, . . . 1411	16. Sidney Sus. Col., . . . 1598
8. Queen's College, . . . 1448	17. Downing Col., . . . 1800
9. St. Cath. Hall, . . . 1473	

The colleges are described under their respective names, as PETER'S (St.) COLLEGE, &c.

The terms of the university are three, and are fixed by unvariable rules. Michaelmas or October term begins on the 1st of October, and ends on the 16th of December. Lent or January term begins on the 13th of January, and ends on the Friday before Palm Sunday. Easter or Midsummer term begins on the Friday after Easter-day, and ends on the Friday after Commencement-day. Commencement day is always the last Tuesday but one in June. The university is represented by two members in the House of Commons. This privilege was granted by James I. in 1614. The number of electors in 1880 was 6400.

The public buildings which belong to the university are the Senate-house; the University Library, which contains about 2000 MSS. and a constantly increasing number of printed books, being one of the few institutions entitled to receive a gratuitous copy of every published work; the public schools; Great St. Mary's Church; the Fitzwilliam Museum, founded on a bequest in 1816, of Richard Fitzwilliam, an Irish peer; the Astronomical Observatory, situated on Madingley Hill, near Madingley House, a fine mansion which was the residence of the Prince of Wales when at Cambridge, and is said to be the scene of Grays' Tragedy; the University or Pitt Press, the Anatomical, and Geological and Mineralogical Museums; and the rooms of the Cambridge Philosophical Society. The University Laboratory, the magnificent gift of the chemist Mr. was built in 1872-73. To the university also belong the Botanic Gardens. In 1873 a college for ladies was erected at Gorton, about 2 miles from the town, and a Wesleyan Methodist college was established in 1870. Newnham Hall, for students coming from a distance to attend lectures for women, was opened in 1870. Cavendish College, which has a charter of incorporation, was inaugurated in 1876, its object being the attainment of the B.A. degree at a moderate cost and at the earliest practicable age; Ridley Hall, opened in 1882, has been built for the purpose of training young men in the evangelical principles of the Church of England. The *Cambridge University Calendar*, published annually, gives the most recent information respecting the university.

CAM BRIDGESHIRE, an inland county of England, is bounded W. by Huntingdonshire and Bedfordshire, E. by Suffolk and Norfolk, N. by Lincolnshire, and S. by Hertfordshire and Essex. Its greatest length is about 50 miles, its greatest breadth about 30, and its circumference about 150. The area is 820 square miles, or 525,000 acres. The population in 1881 was 185,594, as compared with 186,506 in 1871. The county virtually comprises two shires, the shire proper and that of Ely.

The whole of the northern part of the county, and much of the centre, are included in the large tract of fenny land called the Bedford Level, in which the towns and villages are on spots which rise above the general level of the fens.

The churches crowning these slight elevations may be distinguished at a considerable distance. Part of the north of the county still retains its old name of the Isle of Ely

although, owing to its having been thoroughly drained, the designation is not now strictly accurate. The southern part of the county has gently rising hills, with some wood in those parts which border on Suffolk, but little in other places. The hills are few in number, and of no great altitude.

The chief river is the Nene, the lower part of which, within this county, divides into three branches, the Cutswater or Shire Drain, the old Nene or Whittlesey Dyke, and Morton's Leam. The Nene is intimately connected with the great draining system of the county. The Ouse flows past St. Ives and falls into Norfolk, and receives the Cam, the Lark, and a number of artificial cuts. The Cam rises in Essex, passes through Cambridge, and connects with the Ouse near Ely. The Lark separates this county in part from Suffolk.

The canals are not numerous, except those which are connected with the drainage of the fens, considerable progress with which has been made since the time of Charles I. There are navigable cuts from the Ouse to Soham, from Cambridge to Stortford, and from Great Shelford to Whaddon. The county is well supplied with good roads, and there is also extensive railway accommodation.

Geological Character. The south and south eastern parts of the county are occupied by a part of the great chalk formation, which extends, within the limits of Cambridgeshire, from Newmarket Heath to Royston; it forms the mass of the Gog Magog Hills, S.E. of Cambridge, and of the Royston Downs. There are also, in Cambridgeshire, two masses of this chalk detached from the principal mass, the Coach and Horses Hill, near Orwell, S.W. of Cambridge, and Maddingley Hill, W. of Cambridge. The chalk of Cambridgeshire consists of two varieties, the upper containing an abundance of the common black flint, and the lower or gray chalk, which contains little or none. The upper chalk is found in the S.E. part of the county; the lower chalk forms the principal hills, and occupies the N.W. part of the chalk range. The chalk district of Cambridgeshire dips gently to the S.E. The chalk rests upon a blue clay called *gault*, which is considered as a variety of the chalk-marl formation that crops out from beneath the N.W. boundary of the chalk. This formation extends to the boundary of Huntingdonshire and Bedfordshire; its thickness is variable, averaging perhaps 200 or 220 feet. It is nearly impervious to water. Fossils of the bear, wolf, and other animals have been found in this formation. In a few places also the irregular line which separates this county from the two just mentioned, the iron sand, which underlies the gault, rises to the surface; it forms excellent garden ground.

Products. The soil of this county is extremely various, consisting of clay, loam, and chalk, both in the uplands and the fens. Although there are some poor commons and heaths, the greater part of the land is fertile. In some spots called white land, which have chalky subsoils, great crops of wheat and beans are raised. The Burwell wheat is in great request for seed in many parts of England, and the cheeses of Cottenham indicate considerable richness in the pastures. The climate in the uplands is mild and healthy; but in the fens, especially those which have not been thoroughly drained, agues and fevers still prevail, though to a much less extent than formerly. The appearance known as the *mirage* is not uncommon in these districts. The first operation on a newly-inclosed fen, when it has been drained, is to pare, by means of a paring plough, the surface on which coarse grass and sedge are growing in a matted state. The sods are then burned, and reduced to a carbonized mass, which, when cool, is spread over the ground. This is immediately ploughed in, and the land is sown with cole-seed or rape, of which an abundant crop is

invariably produced. The cole is fed off with sheep, the land ploughed once, and oats are sown, which produce astonishing crops. This is succeeded by wheat, or sometimes by another crop of oats, in which are sown clover and grass seed, which soon cover the ground with fine herbage. The practice of marling, which is now very general, adds greatly to the weight and improves the quality of the wheat and other kinds of grain grown in the fens of Cambridgeshire, which are now amongst the best corn land in England. A remarkable example of what has been accomplished by draining operations is shown in Whittlesey Mere, where, upon ground which was within recent years a lake, good crops are now raised. The fens are still liable to inundation. Cambridgeshire is one of the driest counties in England so far as the rainfall is concerned.

According to the official agricultural statistics published in 1883, the proportion of land devoted to corn is greater in Cambridgeshire than in any other county in the kingdom, being more than 50 per cent. of the total area under cultivation, which latter amounted to 485,000 acres, or 64.4 per cent. of the entire area. The chief crops are—wheat, 118,000 acres; barley, 66,000 acres; oats, 32,000 acres; and beans, 21,000 acres. Green crops occupied 80,000 acres; clover, 17,000; and 86,000 were devoted to permanent pasture. The live stock consisted of 42,000 cattle, 270,000 sheep, and 45,000 pigs.

The county has few manufactures, and those chiefly such as belong more particularly to an agricultural district. There are paper mills, and some extensive breweries and large malting establishments. Baskets, mats, bricks, and drain pipes are also made to a great extent, and considerable boat-building is carried on.

Until 1883 Cambridgeshire returned seven members to parliament, three for the county, two for the university, and two for the town of Cambridge; but by the Redistribution Bill of that year the town was deprived of one member. Cambridgeshire is chiefly in the Diocese of Ely. The principal towns are—Cambridge, the county town; Ely, containing a cathedral; Soham, Whittlesey, Wisbech, March, Chatteris, Thorney, and Newmarket, celebrated for its races. The principal seats in the county are—Cheveley Park, the residence of the Duke of Rutland; Wharfedale, of the Earl of Hardwicke; Gog-Magog Hill, of the Duke of Leeds; and Robinson House, of Earl Cadogan.

History and Antiquities.—In the most remote period of British history Cambridgeshire appears to have been inhabited by the Iceni, whose territory comprehended also the counties of Norfolk and Suffolk.

Several British and Roman roads crossed this county. Roman antiquities of various kinds have been dug up at Cambridge, Soham, near Wisbech, and other places. The circular camp of Yandolbury, on the Gog Magog Hills; Arbury, in the parish of Chesterton, near Cambridge; or Willingham, on the edge of the fens; and the earthworks round the sites of Round Castle and Castle-Crofts, are probably of British origin. There is a considerable round mound near the former site of Cambridge Castle. There are the remains of a Roman camp at Great Shelford, near Cambridge, a Roman embankment near Wisbech, and many ancient ditches. In the south there are four large dykes extending for several miles, which divided Mercia from East Anglia; the principal of these is the Devil's Ditch. Cambridgeshire contains numerous churches. Among the ecclesiastical buildings of the past may be mentioned the Abbey of Thorney, of which only a small portion now remains.

In the wars between the Saxons and Danes this county suffered severely. In the contest between William the Conqueror and the Saxons the Isle of Ely was greatly distinguished by the martial deeds of Hereward-le-Wake, who was, however, forced to submit in 1074. In the civil wars of Stephen and the Empress Maud, and in the contest between King John and the barons, this county again suffered

very severely. In the troubles which marked the close of the reign of Henry III. the Isle was again the scene of contest. It was taken and fortified by the barons, who ravaged the county and took and plundered Cambridge. The Isle was subsequently retaken by the king's son, afterwards Edward I. During the civil wars of Charles I. this county was at first favourable to the cause of the king; but in 1643 Cromwell took possession of Cambridge, and the Earl of Manchester, being sent down, expelled the most ardent Loyalists from the university. In 1645 Cromwell was again sent to secure the Isle of Ely. When the king was seized by Cornet Joyce, in 1647, the Parliamentary army was at Kenet, in this county, near Newmarket; but the king was conveyed, by Cromwell's order, to Chikarley, near Cambridge, where Cromwell and Fairfax visited him. On the 9th of June in the same year the king was removed to Newmarket.

Of baronial castles this county has scarcely any remains, except of a castle in Chelvey Park and of another at Burywell, both near Newmarket; and earthworks, marking the site of castles, at Ely, Bunn (between Cambridge and Potton in Bedfordshire), and Castle-Camps, near Linton. Some old manor-houses at Swavesey, near St. Ives, called the Castle, are probably the remains of a station-house.

CAMBRO-SILURIAN PERIOD is the name proposed by Professor Phillips for the medial division of the old Palæozoic, for as the name implies, it intervenes between the CAMBRIAN and SILURIAN PERIODS, but it possesses more affinities, both stratigraphically and as to fauna, with the former than with the latter.

This period contains the record of a time of general depression—succeeding the Cambrian, and in some places contemporaneous with it—when the seas were gradually creeping over the land area of the British Isles, and burying it in sediments. What inadequately succeeded this state of things we do not know, as that portion of the record has been lost; however, we find the rocks of the next geological period deposited on the eroded, upturned, and in some cases metamorphosed edges of the Cambro-Silurians; this tells us that during the interval elevation, dislocation, and denudation had taken place, and therefore that a vast lapse of time is unrecorded.

Cambro-Silurian rocks are largely represented in the British Isles, and contain an abundant fauna in many localities, but in the northern part of the area they are much metamorphosed. These strata were extended by Sedgwick and Murchison in Wales, and from the sections there exposed the beds have been classified as follows:—

The **ARENGI** Beds, which are the lowest of the series, appear to succeed the uppermost Cambrian without any break in Merioneth and Pembrokeshire; but on tracing them northwards they are found to overlap successively the older beds, so that between Clonmel and Bangor they are stratified on Lower Cambrian. The bedded beds are argillaceous, and sometimes even conglomeratic, but the upper beds are mostly slaty, and pass into the Llandovery flags, which in turn pass into the Canabac beds and Bala limestone, which are at the top of the series. In the Llandovery and Canabac groups extensive sheets of felspathic lava and some basaltic intrusions occur on two horizons.

The rocks of this period are exposed over large areas of the British Isles, such as is divisible everywhere into the groups indicated above. In the Cumberland area the Skiddaw group represents the Arengi beds; the Borrowdale series of green slates and porphyries, with the Conistone limestone, represent the Llandovery flags, Canabac sandstone, and Bala limestone; other areas are, that of the hill country on the borders of England and Scotland, two large areas on the east coast of Ireland, and several small patches inland; also the Isle of Man. The Highlands of Scotland, a large portion of north-west Ulster and Connaught, and a small area in north-east Antrim are greatly metamorphosed;

but the fossils of the Durness limestone, though not of a British type, show these rocks to be of Cambro-Silurian age.

A numerous fauna is preserved in these deposits, but it consists wholly of invertebrate forms. Only the most important peculiarities can be noticed here. The corals, which are plentiful in the limestones, belong to the orders Rugosa and Tabulata. Graptolites are very abundant, those with cells on both sides, as *Diplograptus*, and the twin forms, as *Didymograptus*, are very characteristic of the period. The Echinoderms were mostly Crinoids. Shells of Brachiopods are very numerous, especially such genera as *Orthis*, *Leptæna*, *Lingula*, *Strophomena*, and *Rhynchonella*. The Cephalopods were some of the largest and most highly organized animals then living; of these the straight-shelled forms—*Orthoceras*—attained their maximum both in size and number in this and the succeeding period. Trilobites are very largely represented, the genera *Bathyrus* and *Agnostus*, which occur in the Cambrian, are also found here; *Asaphus* and *Trinucleus* are very characteristic, while *Calymene* and *Acidaspis* are common to this and the Silurian period; other abundant genera are *Oryzias*, *Phacops*, and *Harpes*. This class of animals attained their maximum size, number, and variety in this and the following periods.

It appears that at one time or another during this period the whole area now occupied by the British Isles was submerged beneath the Cambro-Silurian sea, and towards the close of the period the land from which the sediments were derived probably lay to the north-west. Sir A. C. Ramsay considers that "at the time of the deposition of the Llandovery and Bala beds of our area, our terrestrial scenery consisted of groups of volcanic islands scattered over the area of what is now North Wales and South Wales, and extending westward into the region of the Irish strata of the same age, and northward as far as the sea that then reined where Great Britain now stands." He also surmises, from the distribution of the volcanic ash, "that then, as now, the prevalent winds of this region blew from the west and south-west." It is evident this was a period of peculiar volcanic activity in the British area, for in the Llandovery series there are masses of stratified lava, agglomerate, and ash, that probably proceeded from a submarine volcano; after the ejection of these there seems to have been a cessation of eruptions for a time in this area, but it was renewed later on, as in the Bala and Canabac series we get, at Snowdon and in the Lake district, volcanic ejectamenta that appear to be the products of a subaerial volcano.

CAMBYSES, the second king of the Medes and Persians, succeeded his father, the great Cyrus, B.C. 529. He led an army against Egypt in 525, defeated the Egyptian king Psammenitus, and reduced Egypt to the form of a Persian province. The ruin of many of the monuments of Egypt is attributed to the fury of the barbarian invaders, and of their king, who had become mad. From Egypt Cambyzes marched southwards against the Macrobian Ethiopians; but his army, after suffering severely in the deserts, returned to Thebes with much diminished numbers. A detachment of the Persian army which was sent from Thebes against the Ammonians (Sihah) was lost in the desert. After committing numberless extravagancies in Egypt, slaying the god Apis (a bull) with his own hand, and otherwise insulting the Egyptian religion, he ended by putting his brother Smerdis to death, marrying his sister, which was contrary to the Persian custom, and then killing her by a kick during her pregnancy. Cambyzes died (B.C. 521) of an accidental wound from his own sword at Ecbatana, a town of Syria (not Ecbatana the capital of Media) in a successful campaign against a magian, who pretended to be the murdered Smerdis. This is Herodotus' account; but the account of Ctesias is preferred by the distinguished orientalist, Dr. Georg Ebers, in his account of Cambyzes in the "Egyptian Princess." In this remarkable novel the

profoundest scholarship is concealed beneath the most absorbingly interesting plot. It is almost unique in its combination of accuracy with vivid imagination, and is the best account of these times in Greece, Egypt, and Persia.

CAM'DEN, a city and seaport of New Jersey, United States, is situated on the east side of the Delaware, opposite Philadelphia, with which it has communication by steamer. It is connected by railway with New York, and is the terminus of various lines. The chief buildings are the court-house, various churches and banks, and the railway depots. It is a flourishing city, and possesses shipbuilding yards, foundries, engineering manufactories, and chemical and glass works. The population, which in 1810 did not much exceed 3000, in 1880 numbered 41,659.

CAM'DEN, WILLIAM, an eminent English antiquary and historian, was born in London, 2nd May, 1551. He was admitted into Christ's Hospital within a very few years after its establishment. He was afterwards in St. Paul's School, and finally removed to Oxford. He left the university in 1571, and became an under-maister of Westminster School.

The most celebrated of his works is that entitled "Britannia," a survey of the British Isles, written in elegant Latin. The first edition of this work was published in 1586. Many others appeared in his lifetime with enlargements. A singular fate has attended this book. A long succession of writers have made additions to it, till Camden's "Britannia," which as it came forth from him was but a single volume of no large dimensions, has been swelled out in the successive English editions till at length it has become four folio volumes, of which the principal compilers and editors were Bishop Gibson and Mr. Gough.

After the publication of this work, Camden began to be looked upon as one of the most distinguished scholars of his age. The prebend of Ilfracombe, belonging to the Cathedral of Salisbury, was given to him, though a layman. He was made head-master of Westminster School in 1592, and Clarenceux King-at-arms in 1597. His "Annals of the Reign of Elizabeth" is the next in celebrity to his "Britannia." His folio volume of the works of some of our old Latin chroniclers was printed at Frankfurt in 1603.

Camden died 9th November, 1623, at Clarendon, in Kent. He founded an historical lecture in the University of Oxford, now called the Camden Professorship of History.

CAMEL (*Camelus*) is a genus of old-world RUMINANTS, forming with the LLAMAS (*Auchenia*) of South America the family Camelidae. This family, to which the name Tylopoda (Gr. *tulos*, knot or callus; *pous*, foot) is sometimes given, differs in many important characters from the typical ruminants, approaching in some respects the Pachydermata. The feet are covered with callous skin, and the hoofs are quite rudimentary, appearing only in the nails that protect the tips of the two toes. Horns are not developed in either sex, and the dentition is peculiar. They have not only canines in both jaws, but also two pointed teeth or incisors in the intermaxillary bone. The lower molars are six in number, and the molars eighteen; but in the true camel an additional small premolar is to be found in both jaws on each side. The dentition of the camel may be thus expressed:—

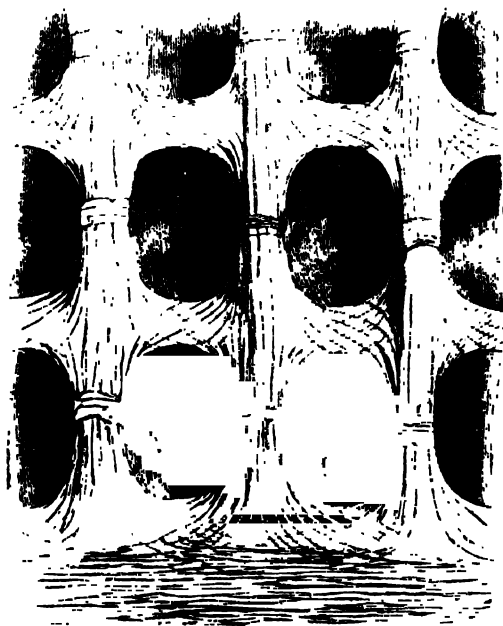
$$\text{Incisors, } \frac{2}{6}; \text{ Canines, } \frac{1+\bullet}{1-1}; \text{ Molars, } \frac{6-6}{5-5} = 31.$$

Another difference between the camels and the other ruminants consists in the separation of the scaphoid and cuboid bones of the ankle.

The head of the camel is long, the upper lip cleft and mobile, the eyes large with a long lashed upper eyelid as a protection, the nostrils slit obliquely, and capable of being opened or closed at will, the ears small, and the neck elongated. The camel is remarkable for the hump, which is a

mere mass of fat, situated on the back, without any distortion or prolongation of the spinal column. This hump is absorbed into the system and greatly diminishes in size when the animal is pinched for food, and during the rutting season, when the males almost cease to eat. One species has two humps. The horny callosities on the breast and points of the limbs, on which the animal rests when it kneels down to receive its burden, are considered by some the result of domestication, though traces of them are observed on the new-born young. The teats are four in number, situated on the belly. The length of the limbs and neck add to the general uncouth appearance of the animal.

The stomach of the camel is so constructed as to form a reservoir of water necessary to the wants of the animal during its long and tedious journeys. The apparatus for receiving and retaining the water consists of an assemblage of cells in two compartments of the paunch, these cellular receptacles being apparently analogous to the reticulum of ordinary ruminants. The compartments are divided by a strong muscular ridge, and it is in the first compartment



Water-cells in the Paunch of the Camel

that the chief assemblage of tanks is for water, the other being more superficial.* In his "Lectures on Comparative Anatomy," Sir L. Home thus sums up the functional results of the complicated mechanism which he describes at great length and very minutely:—"It is evident that the second cavity neither receives the solid food in the first instance, as in the ruminant, nor does the food afterwards pass into the cavity or cellular structure. The food first passes into the first compartment of the first cavity, and that portion of it which lies in the recess, immediately below the entrance of the oesophagus, under which the cells are situated, is kept moist, and is readily returned into the mouth along the groove formed for that purpose, by the action of the strong muscle which surrounds this part of the stomach, so that the cellular portion of the first cavity in the camel performs the same office as the rumen in the ruminants with horns. While the camel is drinking, the action of the muscular band opens the entrance of the second cavity at the same time that it directs the water into it; and when the cells of that cavity are full, the first

runs off into the cellular structure of the first cavity, immediately below, and afterwards into the general cavity. It would appear that camels when accustomed to go journeys in which they are kept for an unusual number of days without water, acquire the power of dilating the cells so as to make them contain a more than ordinary quantity as a supply for their journey; at least, such is the account given by those who have been in Egypt. When the cud has been chewed, it has to pass along the upper part of the second cavity before it can reach the third. How this is effected without its falling into the cellular portion could not, from any inspection of dried specimens, be ascertained; but when the recent stomach is accurately examined, the mode in which this is managed becomes very obvious. At the time that the cud has to pass from the mouth, the muscular band contracts with so much force that it not only opens the orifice of the second cavity, but acting on the mouth of the third brings it forward into the second, by which means the muscular ridges that separate the rows of cells are brought close together, so as to exclude the cavities from the cud through which the cud passes."

The whole organization of the camel proves its adaptation for the arid deserts over which it is destined to travel. The

pads or sole-cushions of the spreading feet, divided into two toes without being externally separated, which with their expansive elasticity buoy up, as it were, the whole bulk from sinking in the sand, on which the animal advances with silent step—the nostrils so formed that the animal can close them at will, so as to exclude the drift sand and the parching simoom—the beetling brow and long lashes which fringe the upper lid, so as to screen the eyes from the glare of the sun—the cleft prehensile upper lip, and the powerful upper incisor teeth, for browsing on the dry tough prickly shrubs of the desert—the hump acting as a reservoir of nutriment against a time of long abstinence—and the assemblage of water tanks in the stomach—these are all proofs of design.

The genus *Camelus* contains two species, both in a state of bondage, and known to the ancients from the earliest antiquity.

1. The Bactrian Camel (*Camelus bactrianus*) is an inhabitant of Asiatic Turkey, Persia, and the elevated plains to the north of the Himalaya Mountains. It is a comparatively rare species, but easily recognized by its possessing two humps on the back. The Bactrian camel is stout, thickset, and awkward-looking, and varies very much in colour, the



Bactrian Camel.

fur being long and shaggy, especially underneath the chin and throat. Pallas states that very large camels, with two humps, were wild in the deserts of Shamo, towards the frontiers of China; but there is reason to believe that these are descendants of individuals liberated by the Calmucks on some pretext of religion. Occasionally a Bactrian camel is to be seen in Egypt and Arabia, brought from some remote province.

The manners of the Bactrian camel resemble those of the Arabian, and its utility is quite as great. It is the patient, laborious, and willing slave of man, travelling over sandy deserts, and submitting to the wants of a wandering people.

2. The Arabian Camel (*Camelus dromedarius*) is sometimes, though improperly, called the Dromedary, that name being more correctly reserved for a swift antelope. This camel is about 8 feet in length, and has but one hump on its back. It is spread through Egypt, Arabia, Syria, North

Africa, Persia, India, &c., and its history is interwoven with that of the patriarchs of old, nor is it now less important than in those early days. It is to these camels that the name "ships of the desert" has been given; and there is little exaggeration in the term, for they are the living machines, by means of which communication is kept up across the most desolate and frightful deserts, which, without some such aid, would be entirely impassable by man. The load of a camel is from 500 to 600 lbs., and it will move at the rate of nearly 3 miles an hour regularly as clockwork, day after day, for eight hours daily. It lies down, resting on the callosities of its breast and limbs, to be loaded and unloaded.

The senses of the camel are very acute; and it scents water at a great distance, hastening its pace to the well or fountain even when ready to drop from exhaustion. The most marked characteristic of the camel is its stolid obstinacy; even its highly extolled patience seems to be a

negative virtue, and to spring rather from stupidity than goodness of disposition.

It is on camels that the Orientals perform their pilgrimages. In these extraordinary journeys the camel sustains an important part. Without its services the pilgrimage could not indeed be accomplished. Some of the animals are loaded with water-skins, some with merchandise, others carry the food and necessities of the pilgrims and their own provender, and others are mounted by riders. Travelers describe the cavalcade as imposing.

The camel is not only serviceable as a beast of burden, but its milk and flesh are both in requisition, especially the former. Even the store of water in its stomach is pressed into the service of its master, for, according to the accounts of travellers, the camel is often killed to supply the water so necessary in the arid deserts. Of its hair the Arab weaves clothing, and even tents; his belt and sandals are the produce of its hide; and the dung affords him fuel. From the soot, sublimated in closed vessels, is procured sal-ammoniac, formerly imported into this country from Egypt. Camel's hair is imported into this country for the manufacture of pencils for the painter; that from Persia is the best. There are three qualities—black, red, and gray; the black is most valuable, next the red, the gray being very inferior.

Two species of camels occur fossil in the Tertiary deposits of the Siwalik Hills in India.

CAM'EL, a machine of Dutch invention for raising large ships so far above the water line as to enable them to pass over the obstruction of a bar or shallow. It is formed of two half-ships, which are applied to each side of the hull of a vessel, and from which cables are passed under the keel and attached to windlasses on the deck. When required to be used, water is allowed to enter so as to sink the two halves to the requisite depth; the ropes are then cast loose, and large beams placed through the port-holes, with their ends resting on each side of the machine. The ropes being made fast, and the ship secured, the water is pumped out, when the camel rises, and with it the ship.

CAM'ELFORD, a decayed market-town of Cornwall, 16 miles W. by S. from Looe-ston (which is the nearest railway station), and 282 miles from London. The town is situated in a high and hilly tract near the moors. It is ill built, but the streets are broad. The river Camel of Altn, which rises about 4 miles to the N.N.E., flows through the town, and gives its name to it. Camelford is a municipal borough; the town-hall was built in 1406. The parish church is at Lanteglos, more than a mile to the S.W.; it was the scene of a battle between King Arthur and his nephew Mordred in 513, and of another between the West Saxons (under Egbert) and the Britons in 823. King Arthur's ruined castle at Tintagel is 4 miles distant on the cliff. At Delabole, about 2 miles from Camelford, are extensive slate quarries. Camelford formerly returned two members to the House of Commons, but was disfranchised by the Reform Act of 1832.

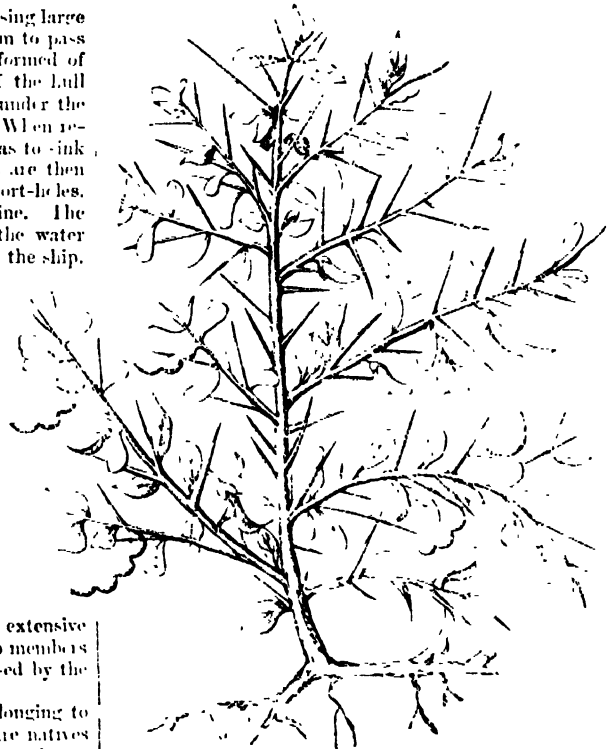
CAMEL'IA, a genus of trees or shrubs belonging to the order TERNSTROMIACEÆ. All the species are natives of tropical and subtropical Asia, China, and Japan, whence they have been introduced into Europe. *Camellia japonica*, a species with broad shining leaves and red flowers, is the origin of the numerous beautiful varieties now so common in gardens. The principal part of these have been raised by the skill of the Chinese or Japanese, and are remarkable, not only for their gay colours, but for the great symmetry with which their petals are arranged, the flowers, when seen in perfection, resembling nothing so much as beautiful shell-work. The sorts that have been raised in this country are in most instances inferior to the Chinese

in symmetry, but they occasionally surpass them in richness of colour. Camellias succeed best when treated as conservatory plants. They are multiplied by cuttings, grafts, and buds, and also by seeds, which the Wandach and some single sorts produce in plenty. The genus, as defined by Bentham and Hooker, includes the tea-shrub. There are fourteen species. In the flowers the sepals are very unequal, the petals imbricate, the exterior stamens monadelphous, anthers versatile, ovules few and pendulous. The name is derived from Kamelli, a Dutch lieutenant-governor in Luzon. His collection of plants, sent to Holland in 1700, are now in the British Museum.

CAM'ELOPARD. See GIRAFFE.

CAMELOP'AR'DALIS (the Camelopard or Giraffe), a constellation formed by Hevelius to fill up a gap in the neighbourhood of the north pole. A line drawn from Capella to the pole-star passes right through the body of the constellation. No doubt the long neck of the animal was required to fill up the star map (see PLATE CONSTELLATIONS, N. Hemisphere, close to the center), but it seems a pity the constellation could not be called Camelus for greater convenience.

CAMEL'S THORN is the common name for a genus of plants. Although, which belongs to the Pea family, or LEGUMINOSÆ. There are six species, but Bentham and Hooker consider that these are probably varieties only of



Camel's Thorn (*Alagi maxarum*).

one species. They occur in arid, desert places, from Greece and Egypt to Sanguia and the Himalayas. They are shrubby plants with many rigid branches, and bristling all over with hard spines. The leaves are small and single; the flowers red; the pod contracted between the seeds, which are separated by divisions, the joints, however, not separating. An exhalation takes place from some of the varieties in the form of drops, which quickly turn in

Camels are very fond of this resinous substance, which is one of many that are called manna.

CAM EO, in the language of art, is a term usually applied to gems or stones that are worked in *rilievo*. Strictly speaking, it refers to such stones only as have strata or grounds of different colours.

The art of engraving on stone is of high antiquity, but it was for the most part confined to *intaglio*, or indenting. It has been supposed that the Etruscans had the art of engraving hard stones before it was known to the Greeks. Many engraved stones, however, that are called Etruscan are doubtless early Greek, as may be inferred from their subjects.

The earliest Greek artist mentioned as an engraver of stones is Theodorus of Samos (Herodotus, lib. 11). Pyrgoteles, who lived in the time of Alexander the Great, was distinguished in this branch of art. The age of Augustus is remarkable for the excellence of the gem engravers who were then living. One of the finest camoes preserved in the collections of Europe is the Apheosus of Augustus, in the collection at Vienna. In the French collection the sardonyx of Tibullus is one of the best known. We possess in this country some gems of first rate excellence, but they are chiefly in private collections.

Pl. workers in enamel not only exercised their skill in the cutting or engraving, but also in so arranging the subject as to the composition of its details as to make the different colours or zones of the stones answer for parts of the design. The ancients were so partial to this variously coloured work, that they even imitated the material in glass; and we possess in this country one of the most beautiful specimens of their ability, in the Barberini Vase, or, as it is commonly called, the Portland Vase, now in the British Museum.

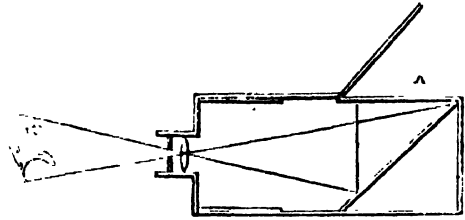
At the decline of the Roman empire gem engraving fell with the other arts, and it was not till a late period that the art, under the patronage of the Emperor Charlemagne, revived its reputation. It was much improved in the fifteenth century, and the sixteenth century can also boast of several very distinguished artists in this science. In the succeeding century there was a considerable improvement in the art, though the art again declined. The practice of working camoes on shells (*camœlæ*) of the opaline variety, common in Italy, but it is now confined to a great extent, particularly in Rome.

CAM ERA OBSCURA and **CAM ERA LU'CIDA** the dark and light chambers are the two directions, very like in principle of throwing light upon external objects upon a plane or a curved surface for the purpose of drawing or painting them. In the latter chamber, there is, indeed, a *chambre*; but as it was the last invention, and as its principle had been taken *en passant*, it was called *camera lucida*.

The earliest description of the camera obscura is in the second book of the "Magia Naturalis" of Giordano Bruno, who directs a small aperture to be made in the wall of a perfectly dark room so as to let the light fall upon the opposite wall; he afterwards placed a convex lens at the aperture, and it is evident that with or without the lens, inverted images of the object will be formed.

The *camera obscura* now in use has, occasionally, the form of a box, or of the ordinary wooden, which may represent a natural section of one. In front is a sliding tube, carrying a convex lens through which the light from distant objects passes to converge at the opposite extremity of the box, to form an inverted image to the horizon at an angle of 45° from the centre light is reflected upwards to a glass plate, at a right angle position. The rays in the pencils converge at the upper part of this plate, which, on that surface, creates a camera lucida, and thus the images of distant objects are visible upon that plane over the plate, preventing the direct light from entering with them,

A camera obscura for exhibition is generally made in a room with a conical roof and an aperture at the top. Above this aperture is a revolving plane mirror inclined at 45°, and reflecting pencils downwards. A convex lens causes these pencils to converge upon a surface of plaster of Paris,

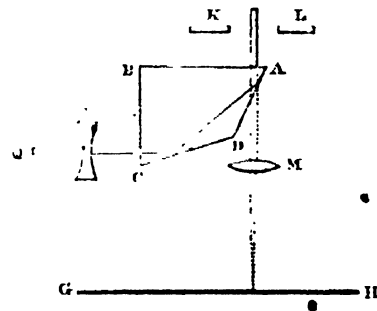


properly enlaid. The mirror revolves about a vertical axis, thus allowing all the compass points of a landscape to be successively thrown on the surface.

Portable camera obscuras are often made in a similar manner, the mirror and lens being in a sliding case at the top of a pyramidal box, and the image being received on paper laid at the bottom. Apertures on one side of the box allow the spectator to see the image and introduce a hand for the purpose of drawing on the paper.

The camera obscura in a particular form is the chief tool of the photographer, and this variety of it is accordingly described in the article PHOTOGRAPHY.

The *camera lucida* was invented by Dr. Wollaston, and consists of a metal stand supporting a glass prism, of which let A D C be a section, the angle A D C being 135°. Imagine pencils of rays from distant objects (these being represented by q) after passing through the surface at n c, to



fall on the surface, c v, at an angle of 22½° nearly; then, by a principle in optics, the rays will be reflected to the surface A D, and from thence to the eye through an opening K L, which excludes all except the end of the prism at A, and a part of the sheet of paper or other flat surface, G M. Hence the image of q is thrown towards the visible part of the paper, and, the eye viewing both the image and the sheet of paper (with different parts of the pupil, however, which creates a difficulty in using this instrument), the observer is enabled to trace the object upon the paper.

The image of the distant object must be made to coincide with that of the paper at G M; and, for this purpose, since, except when q is very remote, the rays in the pencils issuing at A are in a divergent state, a convex lens is interposed at M. If the observer is short-sighted, he may either place a concave lens at S instead of the lens at M, or, which is better, he may retain this lens, and use spectacles with concave glasses.

CAMERINO (the ancient *Camerinum Umbrorum*), a city of Central Italy, in the province of Macerata, 40 miles S.W. of Ancona, was formerly the capital of a delegation in the Papal States. It is situated on a height at the base

of the Apennines; it has a cathedral—erected on the site of a temple dedicated to Jupiter—and a university; and is the seat of an archbishop. Carlo Maratta, the artist, was born here. There is a considerable manufacture of silk carried on. Population, 12,000.

CAM'ERON, RICHARD, one of those Presbyterians who resisted the attempt to impose episcopacy on Scotland in the seventeenth century. He was born at Falkland in Fife, taught for some time a public school there, and was afterwards private tutor and chaplain in the family of Sir William Scott of Harden, whose lady was a nonconformist. He was prevailed on by Welsh, grandson of John Knox, to accept of license to preach, and exercised his gifts in different quarters, but chiefly in Annandale, Ayrshire, and Galloway. Cameron refused the indulgence offered by Charles, because of the erastian and galling conditions with which it was clogged, of its tendency to betray the covenanting interests, and of its contrariety to the grand principles of presbyterianism. When called to account for the freedom of his strictures on this measure, he came under a promise of silence, which on mature consideration he found himself bound in conscience to recall. Having in this way lost his situation in the family of Sir William Scott, he went to Rotterdam, where he preached to certain persecuted exiles; and, after having been ordained by Messrs. M Ward, Brown, and Roleman, he returned to Scotland in 1680. He was concerned, along with Cargill, Donchias, and others, in what was called the *Sanguinary Declaration*, in which they renounced the authority of Charles—a deed which may be censured as rash and premature, but which has this to be said for it, that it proceeded on the very same principles on which the whole nation, a short time afterwards, expelled Charles' successor from the kingdom. A price having been set on their heads, Cameron and his friends were obliged to betake to the field, and defend themselves by arms. They were surprised at Airness, a wild moorass in the parish of Auchinleck, by a troop of dragoons under Bruce of Eulshull; but after a gallant resistance, which even their enemies could not help applauding, they were overpowered, and several of them killed on the spot, amongst whom was Richard Cameron. His head and hands were cut off, and carried with a ruthless enmity to his father, from whom the sight only drew an expression of pious resignation to the will of God. His death gave rise to many touching displays of sympathy and regret, and a monument still marks the spot where Cameron fell. It is from this individual that the Reformed Presbyterians of the present day derive the vulgar sobriquet of Cameronians.

CAMERO'NIANS, a religious body, so called from the Rev. Richard Cameron, a nonconformist preacher. They are sometimes also called "Covenanters," from their adherence to the National Covenant of Scotland, and the Solemn League and Covenant of the three kingdoms. Their proper designation, however, is that of REFORMED PRESBYTERIANS.

CAMEROONS' or CAMAROONS, a mountainous district on the W. coast of Africa, situated on the Bight of Biafra, opposite the island of Fernando Po. The mass of mountains, of which the district is chiefly composed, covers about 380 square miles, but offshoots extend much further inland. They are of volcanic origin, and on the summits of the highest mountain, attaining 13,120 feet, there are craters, said to have been in eruption within the memory of man. The rocky character of the country offers great impediments to communication, progress along the rivers being stopped by impassable cataracts. One of these, on the mountain near Bouda, has a clear fall of 50 feet during the rainy season. It is known as the Thomson Falls, from its discoverer. The chief rivers are the Cameroons, the Tabingou or Abo, the Langou (the two latter discharge into the estuary of the Cameroons), the Loga,

and the Mungo. For some miles round Cape Snellaba the country almost entirely consists of mangrove swamp; on the few hard spots the fishermen build their huts during the fishing season and when they are catching the shell-fish, which are abundant here, whence the name Cameroons is said to be derived, the Portuguese word *camarões*, meaning shrimps or prawns. There are numerous tribes, each speaking different dialects; the most important people is the Duallas.

The climate on the sea coast during the dry season is very invigorating to Europeans, as the breeze on the early morning brings the cold air from the mountains; that of the middle zone offers a favourable spot for the establishment of a sanatorium. Properly cultivated the country might be made to yield every variety of vegetable. Mangoes, oranges, guavas, bread fruit, palms, &c. are plentiful, and the coffee and the cacao plant have been successfully grown.

CAMEROONS, a river in the district of Cameroons, which discharges its waters into the Bight of Biafra by the sea estuary as the Malimba or Bimbila River, about 15 miles E. from Fernando Po. This river is divided from those to the westward by the Cameroon Mountains, which attain an altitude of 13,000 feet. It has an extensive alluvial channel 20 miles broad, but is only navigable for about 70 miles inland, as beyond this it is interrupted by cataracts. In this part of Africa is the great market for slaves, palm oil, and ivory; the name is derived from *cameroon*, a surname of which there is great abundance in the river.

CAME'TA, a town of Brazil, 85 miles N. of S.W. of Porto Belém. It is the capital of the state of Pará, which joins the majority of the American states. The district round about is fertile, and is well populated, with about 20,000 inhabitants.

CAMIL LUS, MARCUS FURIUS, one of the great semi-mythical heroes of the ancient history of Rome, lived about the middle of the fourth century after the foundation of Rome. There is some ground for the fabulous history that one may reasonably suppose that Eury and Phalaris derived the traditions respecting him from an old poem. But even Nubel has not attempted to deny that the actual personality which he is supposed to embody is Roman history. Camillus was a consul for five times, and triumphed four times, but was never consul. His last dictatorship was in the fourth year of the siege of Veii, which was taken by him in B.C. 396, probably by means of a ruse, by which part of the walls were thrown down. Camillus was accused of unfairly distributing the booty from Veii; whereupon, much hurt, he retired to Ardea, and lived there till the battle of the Allia, and the capture of Rome by the Gauls, caused the Romans to implore in their own capital to elect him a second time dictator in his absence. He led the Ardeates and allies at once on Rome, and after two battles, the one fought in the city and the other on the road to Capua, he completely exterminated the Gallic army. In 368 he was made dictator, as being the most able defender of the patrician privileges, specially to resist the TRIBUNIAN ROGATIONS. The next year he again completely defeated the Gauls. He died of the plague in 340.

CAM OENS. DOM LUIS DE CAMOENS is supposed to have been born at Lisbon. The year of his birth is uncertain. According to some it was 1527, while most biographers suppose it to have been 1524.

Camoens was sent to the University of Coimbra, where it appears from his works that he must have acquired the substance, as well as caught the spirit, of every science. On quitting the university, Camoens returned to Lisbon, and distinguished himself by some poetical productions, but to be at once a hero and a poet was his real dream. He joined, as a volunteer, an expedition which John III. was

then fitting out against the Moors of Ceuta, and greatly distinguished himself in several encounters, in one of which he lost his right eye. On his return to Lisbon, no friend seconded his efforts at court to gain an honourable competence, and baffled in all his expectations, he embarked in 1553 for India, in the hope of better prospects. He arrived at Goa, and joined a Portuguese expedition which was ready to sail in aid of the King of Cochin against the King of Portugal. After serving in another expedition to the Red Sea, against the Arabi corsairs, he was banished to the island of Macao, in consequence of having exposed, in his "*Disputas na India*" (Follies in India), some of the proceedings of the Portuguese authorities at Goa. He received permission from a new viceroy to return to Goa, but he had not long enjoyed repose when another viceroy threw him again into prison. A poem at once witty and affecting, which he addressed to the viceroy, at length procured his liberation. Finally Camoens, after an absence of nearly sixteen years, arrived in 1569 at Lisbon, in the most abject poverty, his poems being the only treasure and last hope which he had brought from the shores of India. More ill-fated still at the end of his career, he found his native city afflicted with the plague, and during such a calamity poetry could avail him still less than ever. King Dom Sebastian was then concerting the plan of his unfortunate expedition to Morocco, and thus induced Camoens to dedicate his poem of the "*Lusiad*" to the youthful monarch. Although the dedication was graciously received, it was only rewarded with a wretched pension, not sufficient to relieve the misery of its author. It appears that Cardinal Henry, who succeeded Sebastian, withdrew that small pension, and the poet ultimately died in an hospital in Lisbon 18th June, 1579, in circumstances of the most extreme poverty and distress.

Camoens attempted every style of poetic composition of which he had formed a definite idea; but the "*Lusiad*" rises so far above his other works, that all his numerous but less successful compositions must be considered as inferior specimens spring from the same root. The title of the work, "*Os Lusíadas*" (the Lusitanians), denotes the nature of the subject. An epic grouping of the most important event in the Portuguese annals forms the groundwork of the poem, which, designated as a whole, may be termed an epic national picture of Portuguese glory.

Camoens has left, besides the "*Lusiad*," specimens of no common merit in every style of poetry written in Portugal in his time: 201 of his sonnets which have been preserved exhibit his poetic fancy, and some of them show all the tenderness and grace of Petrarch. He wrote also seventeen cantatas (songs), twelve odes, and twenty-one elegies. Finally, to leave no kind of poetic composition unattempted, he wrote (probably previous to his departure for India) three dramas: "*O Rei Seleuco*" (King Seleucus), "*Os Amphitryões*" (the Amphitryons), and "*Lucretia*."

A very good edition of the works of Camoens appeared at Lisbon in 1779-80, under the title of "*Obras de Camoens, Poeta e Poeta das Hespanhas*," 4 tom. 12mo. A second edition also appeared in 1782-83, in five small volumes, the first of which contains the life of the author and the "*Lusiad*," and the last the dramatic and other pieces ascribed to Camoens. A splendid edition of the "*Lusiad*" was published at Paris in 1817. This edition was reprinted in 1819, and a third time, with emendations, in 1823. A translation of the "*Lusiad*" into English was published in 1881.

CAMOMILE. See ANTHEMIS.

CAMP, ROMAN. The most complete description which we have of a Roman camp may be found in Polybius, who has, in the sixth book of his "*History*," given a good account of the military tactics of the Romans. He lived at a time when the institutions of the republic were

in their full vigour, and his opportunities of acquiring information were ample.

When a place suitable for a camp had been chosen, the first thing was to fix a standard on the spot judged to be best adapted for overlooking the army when encamped, and sending commands to the different quarters. About this spot, within a space of 200 feet each way, was the *prætorium* or place of the general's quarters, on one side of which was the forum, and on the other the space allotted to the stores of the army, with the quarters of the *questor*, or officer who had charge of the military chest. Further, towards the right and left were the cavalry and infantry, forming the general's body-guard, and the volunteers in his service. This line, which in length may be estimated at 1650 feet, constituted the breadth of the camp. In front of the line were the tents of the legionary tribunes and of those officers among the allies who had attained to corresponding rank.

Before the tribunes' tents was the principal street, 100 feet wide, stretching across the camp; and beyond this, extending about 1050 feet towards the front, were the quarters of the soldiers. These were divided into two parts by a street 50 feet wide, which ran from the *prætorium* to the head of the camp. On each side of this street were posted the Roman cavalry, and on their exterior the *Triarii*, one of the divisions of the legionary infantry. A street parallel to the former, and 50 feet wide, separated the tents of the *Triarii* from those of the *Principes* and *Hastati*, the other divisions of that infantry; and another street of equal breadth divided the legionary troops from the cavalry and infantry of the allies; these last constituted the two wings of the army. Behind the *prætorium* was a street 100 feet wide, extending the whole breadth of the camp; and beyond this, towards the rear, were the quarters of the "extraordinary cavalry" and "extraordinary infantry" of the allies. On the flanks of these troops were quarters for any foreigners or reinforcements of allied troops.

Such was the order of encampment for a consular army, consisting of two legions besides the allies; its whole depth might be about 1700 feet, and there was round the encampment a clear interval, 200 feet broad, between the tents and the intrenchments. These consisted of a rampart (*vallum*) and a ditch (*fossa*), through which were four gates or entrances: the *Prætorian gate* (*Porta Prætoriana*), in front of the camp, opposite the *Prætorium*; the *Decuman gate* (*Porta Decumana*), at the back of the camp; and a gate at each end of the *Principia*, or principal street.

If two consular armies were united, the camp formed an oblong square, and resembled two camps placed back to back, without any intervening intrenchment. It appears to have had six gates, two *prætorian* and four others, one at each end of the two principal streets or passages.

The *vallum* was composed usually of earth or turf, sometimes of stones or wood, and was surmounted by a palisade. The ditch was on the outside. On plains the Roman camps were almost invariably rectangular, but on hills the *vallum* was adapted to the outline of the ground on which the camp was constructed. In stations which were designed to be permanent, and which were in a disturbed or hostile country, the works were constructed with unusual care, and there are many remains of them in different parts of Great Britain. For defences of modern military camps see **Fortification**.

CAMPAGNA DI ROMA was the most southern division of the former Papal States, and almost identical with the ancient *Latium*. The length of the district, reckoning from Ostia to Terracina, is about 90 miles, and its greatest breadth 15 from the Apennines to the sea. Some authorities apply the name to a much smaller area lying immediately round Rome. It is divided into two

regions, the lowlands and the highlands, including the valley of the Sacer and part of that of the Tevere. The highlands, which are the healthier portion, are situated in various parts of the province, and exhibit great diversity of feature and fertility. There are among them a few summits from 2000 to 4000 feet in height. The lowlands of the Tiber, which average about 200 feet above the sea, and form what is called l'Agro Romano, or the territory of the city of Rome, contain about 450,000 English acres, about half of which is arable, and a small portion marshy. The great plain between the south slope of the Monti Lepini and the sea, which is known by the name of the Pontine Marshes, extends from Torre Tré Ponti to Terracina, a length of about 22 miles by 10 of breadth. Of this only the lower tract is really marshy. Of the whole of the marshy ground, one third is susceptible of cultivation; another third is in pasture, and the rest forest or marsh. The extent of the province of Campagna, including that part of the territory or jurisdiction of Rome which lies on the left or east bank of the Tiber, is calculated at 1400 square miles, of which about one-half is unwholesome, and is only sparsely inhabited. The Campagna, which was once covered by the sea, bears evident traces of volcanic action, and the waters of the lakes rest in the basins of extinct craters. This region was traversed by the Appian Way.

The farms of the Campagna are very large. Some hundreds of labourers are engaged every year from the highlands for the service of one farm, between the months of October and June, and double the number at harvest time, after which they return to their hills, or go to the hospitals of Rome with the malaria fever. During the hot months only a small number of permanent servants remain. This system is rendered necessary by the malaria.

The Campagna would appear in ancient days to have been well peopled, but owing to its conversion by the Romans into large estates, and the consequent disappearance of the peasantry, together with its frequent devastation by war and pestilence, induced by the rivers overflowing and forming marshy ground, it has become the thinly occupied territory it now is. Various attempts have been made to improve its condition by drainage and cultivation, notably by Pope Pius VI. and General Miollis during the French occupation. Again, in 1872 the Italian government appointed a commission to make a thorough investigation. Their report contained comprehensive and valuable statistics, and gave a vivid idea of the terrible unhealthiness of the district, but failed to indicate any measures by which any change in its actual condition could be facilitated. In 1875 Garibaldi took up the subject, and strenuously advocated some plans of reclamation, which, however, were not adopted. The only plan which seems to have any chance of success is the gradual pushing forward of the belt of cultivation which exists around Rome in the form of vegetable gardens. All such attempts, however, cannot be otherwise than abortive as long as the land is occupied by farms and pastures on a large scale. An entire revolution in the present system, energetically and comprehensively carried out, will alone avail to restore the prosperity of the land. About one-half of the Agro Romano belongs to ecclesiastical corporations, one-third to the nobility, and barely the remaining one-sixth to small proprietors. These large estates are usually let to *mercanti di Campagna*, or contractors on a large scale, of whom there are not more than forty altogether, on leases of three years by the ecclesiastical bodies, and of nine years or more by the lay proprietors. These contractors intrust the management of the land to a *fittore*, or bailiff, who resides at the *tenuta* or *casale*, as the farm-house is called. The system of tillage and the agricultural implements used are of a very primitive character.

CAMPANIA, the Roman name of that part of the

kingdom of Italy which is now divided between the provinces of Terra di Lavoro or Caserta, Naples, Avellino, Benevento, and Salerno. The Liris was the boundary between Campania and Latium. Campania is chiefly a plain inclosed between the sea and the mountains, which form a semicircular sweep from the mouth of the Liris to the promontory of Minerva. It was celebrated for its extraordinary fertility and its genial climate. The Campanians of Capua—the capital—after being allies of Rome, took the part of Hannibal, and were severely treated by the Romans in consequence. Among other cities Herculaneum and Pompeii may be mentioned. The Appian Way and other Roman roads passed through Campania.

CAMPANILE, an Italian term signifying a tower or bells. The word is derived from *campana*, a bell. Many of the Italian churches have these towers or campaniles separated from the body of the church. Among the most remarkable are those of Cremona, Florence, Ravenna, Padua, Bologna, Siena, and Pisa. The campanile of Cremona is the highest in Italy, having an elevation of 395 feet. The cathedral at Seville, in Spain, has a fine campanile 350 feet high, which was built in 1568 by Gueyter the Moor. Many of the bellfries of the town-halls of Italy are also noble specimens of work. The tower of the Palazzo Pubblico at Siena, and that of the Palazzo Vecchio at Florence, are very beautiful.

The latter (see Plate, fig. 1) is a noble example of the "breadth of surface" demanded as a characteristic of the grand in architecture. Here the effect of the building is made by the mass of wall, not by the lines dividing up the walls; and the dignity gained by the grand pile being seen at one glance from base to summit, makes of it a low infinitely St. Peter's has suffered from the want of this unbroken sweep of the eye. The "skeleton frame of projection (not a scowl)" is very impressive; the rice made by the battlemented machicolations is finer in both in eyes than the finest of Greek cornices. "No towers are so grand as the square-browed ones with massy cornices and battlements," says Mr. Ruskin in the "Seven Lamps," and indeed we cannot do better than quote the laws of towers as laid down by that keen observer and true artist in his "Stones of Venice," vol. iii.: "Two characters are common to all noble towers, however otherwise different in purpose or feature—the first that they rise on massive foundation to lighter summits, crowning with battlements, perhaps, but yet evidently more pined and thinner in wall than beneath; and, in most ecclesiastical examples, divided into non-open work; the second, that whatever the form of the tower, it shall not appear to stand by help of buttresses. It follows from the first condition that we shall have continual variation in the arrangements of the stories and the larger number of apertures towards the top." Mr. Ruskin then contrasts St. Mark's, such a tower, with that of the college at Edinburgh, with the full force of sarcasm. "The tower of St. Mark's at Venice (fig. 2) is not a very perfect example, for its top is Renaissance. It is built as simply as it can be, to answer its purpose; no buttresses, no extended features whatever, except some butts at the base and the leg in afterwards built; one bold square mass of brickwork, double walls with an ascending inclined plane between them, with apertures as small as possible, and these only in necessary places, giving just the light required for ascending the slope or stair, not a ray more, and the weight of the whole relieved only by the double pilasters on the sides, sustaining small arches at the top of the mass, each decorated with the scalloped cockleshell. Then when the necessary height is reached the belly is left open, and the whole crowned by a conical spire as the tower would carry to render it more serviceable as a landmark. The Venetian tower rises 350 feet, and has no buttresses, though built of brick; a high sloping roof, but no pinnacles at the angles, and its highest part

at top." ("Stones of Venice," vol. I.) The unfortunate British example—and who does not know a hundred such?—not half the height, built of stone, buttressed thickly, and its upper windows a mere chink, becomes ridiculous in the great critic's hands.

Again we find, in another work of the same author, a beautiful description of Giotto's Campanile at Florence (fig. 1), 267 feet high, begun by that great artist in 1324. "Considerable size, exhibited by simple terminal lines; perfection towards the top, breadth of flat surface, square compartments of that surface, varied and visible masonry, vigorous depth of shadow, exhibited especially by piers and traceries; varied proportion in ascent, lateral symmetry, sculpture most delicate at the base, enriched quantity of ornament at the top, vivid colour introduced in flat geometrical patterns, and obtained by the use of naturally coloured stone. These characteristics occur more or less in different buildings, some in one and some in another. But all together, and all in their highest possible degrees, they exist, as far as I know, *only in one building in the world*—the campanile of Giotto at Florence." Attention should be given to the exquisite form and grouping of the small perforations on the stone which winds, a detail of consummate beauty though so simple. It is known that Giotto intended to crown this tower with a fine spire, but the admiring church community is tempted to forestall any addition to it, even by its architect, should mar its present perfection.

The next tower, and the tower at Pisa (fig. 2) shines against the canvas of the distinguished writer quoted above (who consequently, being over-devoted to consistency, omits it), it seems very beautiful to most eyes. It leans 13 feet in its height of 150, owing to the insecure nature of the ground. The west front of the neighbouring cathedral in like manner leans forward, and (as is also the tower) is laterally uneven as well. See *LOMBARDIC ARCHITECTURE*.

CAMPANULA, a diminutive of Ital. *campana*, a bell, on account of the form of its flowers; a genus of plants, the type of the order CAMPANULACEÆ. The other names of the genus *Campanula* are *Trochilium* and *Cerocarpia*, names which were given to it on account of the supposed efficacy of many of the species in the cure of disorders of the neck and throat. Hence also the common name Throatwort. All the species of which there are 250, are herbaceous, with mostly perennial roots, the radical leaves differing at times from those of the stem, and the flowers generally blue, sometimes violet or white. They are natives of the northern hemisphere occurring in the greatest plenty in the eastern region of the Mediterranean.

Campanula trachelium is a native of Arica (Chile). Its root is thick and sapid, and contains a considerable quantity of starch. It is on this account frequently eaten by children, and also the roots of many other species. *Campanula trachelium* (Nettle-leaved Bell-flower) is a European species. It is found in the south of England, and has large bell-shaped flowers. *Campanula rotundifolia* (Harebell) is a native of Europe, and has pretty blue flowers, and is a favourite tinge of Europe. The juice of the flowers makes a very good dye, and when mixed with alum a green one. The root of this species also may be eaten. *Campanula parviflora* is indigenous on rocks and walls in Cinthia, Caracass, &c. It is native. From its having been a great favourite of the Romans of large it has now become naturalized in many places where it was not originally a native. It is not often found wild in Great Britain, though it is often cultivated for the sake of its tall raceme of bell-shaped flowers. *Campanula rapunculoides* (Rampion) is a native of Morocco, Barbary, also of the south of Europe, at various points as far north as Norfolk in England. It is much cultivated in France and Italy, and sometimes in Britain for the use of the root, which are boiled tender, and eaten hot with vinegar, or cold with vinegar and pepper.

Other British species are *Campanula latifolia* (Great Bell-flower), common in the north; *Campanula rapunculoides*, with a pale blue flower, very rare; *Campanula glomerata*, in calcareous pastures; and *Campanula patula*, frequent in hedges and thickets. In this genus the hemispherical ovary ripens into a capsule, which is closed at the apex, but opens on the sides between the ribs by single pores or small valves.

CAMPANULA CÆ is an order of plants, placed by Bentham and Hooker in the cohort Campanales of the division GAMOPHYLLÆ. The corolla is valvate; the stamens as many as the corolla-lobes; the ovary with two to five cells, and numerous ovules; the fruit capsular or a berry; the plants herbaceous, and usually milky. There are over 1000 species, scattered throughout almost the whole world. They are more abundant in temperate than in tropical regions, most of the herbaceous species belonging to the Old World, while the shrubby species are principally American or insular. The order is divided into three tribes, viz. Lobelieæ, Cyphiceæ, and Campanuleæ. In the two first the corolla is irregular, the Lobelieæ differing from the Cyphiceæ in having the anthers connate round the style.

CAMP BELL, ARCHIBALD, eighth Earl of Argyll, was born in the year 1598. In 1628, when his father was abroad, having left the kingdom, he, who was then Lord Lorn, resigned into the king's hands his hereditary office of lord justice, or, as it came to be styled, justice general of Scotland.

In April, 1638, when the National Covenant was sworn to by nearly the entire population of Scotland, Lord Lorn was called up with others to London to give advice to the king under the existing circumstances of the kingdom, and was the only one who spoke freely and honestly, and recommended the utter abolition of those innovations which his Majesty had made in the constitution of the Scottish Church. He returned to Scotland in May, and on his father's death, the same year, succeeded to all his honours and possessions. He attended the meeting of the General Assembly at Glasgow that year, and openly joined the church against the court, and on the breaking out of hostilities he armed his vassals in support of the cause.

When the king came to Scotland in 1644, with a view to a settlement of the kingdom, Argyll was created a marquess, by the title of Marquis of Argyll. In the disturbance and civil war which soon afterwards followed, Argyll took, as before, an active part. In July, 1646, when the king had surrendered himself to the Scottish army, Argyll went to Newcastle to pay his respects to him, and was afterwards employed in the conference with the parliament of England on the articles presented by the Estates to the king. He took also a leading part in the installation of Charles II. He submitted, however, to the protectorate of Cromwell, and under Richard Cromwell sat in parliament for the county of Aberdeen. For these compliances he was, at the Restoration, indicted for high treason, and being convicted he was beheaded on 27th May, 1661.

CAMPBELL, SIR COLIN. See *CLYDE, LORD*.
CAMPBELL, JOHN, Lord High Chancellor of England, second son of the Rev. Dr. Campbell, minister of the first charge in Cupar-Fife, was born at Springfield 17th September, 1779. He was educated at St. Andrews, and in 1800 enrolled himself at Lincoln's Inn, and studied for the bar. He occupied his leisure time, and added to his rather scanty pecuniary resources, by reporting for the *Morning Chronicle*, receiving his call to the bar in 1806. He had to struggle hard against various difficulties at the commencement of his legal career, but gradually made his way to the front, and after acquiring a large practice obtained his silk gown in 1827. In 1830 he entered Parliament as member for Stafford. He bore his part so well in the great struggle concerning the Reform Bill in

1850-51, that Lord Grey selected him for the office of solicitor-general in 1832, and he became attorney-general in 1834. The same year he was elected as a representative of Edinburgh, retaining this position until 1841, and with the exception of a brief interval, during Sir Robert Peel's short tenure of office, he was attorney-general for the whole of this period. In 1841 he was made chancellor of Ireland, and created a peer of England, with the title of Baron Campbell. He held the office of chancellor only a few months, resigning it on the retirement of the Melbourne ministry. He then published a collection of his speeches delivered at the bar and in Parliament, and commenced his "Lives of the Chancellors," the first three vols. of which appeared in 1846. The same year he became chancellor of the duchy of Lancaster, and on the retirement of Lord Denman he succeeded him as lord chief-justice. In June, 1859, he was elevated to the woolsack. He died 23rd June, 1861. In addition to his "Lives of the Chancellors," which was completed in 1847, he published "Lives of the Lord Chief-Justices of England," in two vols. 8vo, in 1849.

CAMPBELL, THOMAS, an eminent English poet, was born 27th July, 1777, at Glasgow, where his father had spent his life as a merchant. Thomas was the youngest of a family of ten sons and daughters. At the university of his native city, where he was educated, he appears to have distinguished himself rather by his occasional exercises than by his general industry and proficiency. He had left the university some years, and had been for a short space resident in Edinburgh, when he published there, in April, 1799, his "Pleasures of Hope," which brought him at once into great reputation. A seventh edition of this poem appeared in 1802, with other pieces, among which were his noble verses on the battle of Hohenlinden. His spirited and stirring song, "Ye Mariners of England," written in the prospect of war with Denmark, his "Exile of Erin," and his "Lochiel's Warning." He came to London in 1803, in which year he married. In 1806 he received from the Fox ministry a pension of £200 a year, which he enjoyed as long as he lived.

With the exception of a few occasional short pieces, he published no more poetry till his "Gertrude of Wyoming" appeared in 1809, accompanied in the first edition by "Lord Ullin's Daughter" and his "Battle of the Baltic;" and in a subsequent edition by his tale of "O'Connor's Child." In 1818 he made a second visit to Germany, and in the year after his return appeared his "Specimens of the British Poets," seven vols. 8vo. In 1820 Campbell also undertook the editorship of the *New Monthly Magazine*, which he retained till 1830. He died at Boulogne in 1844, and was interred in Westminster Abbey.

CAMPBELL'S ACTS are two Acts of Parliament introduced by Lord Campbell. The first, 9 & 10 Vict. c. 93 (1846), was to compel railway companies to make compensation for injuries by culpable accidents, and the second, 20 & 21 Vict. c. 83 (1857), was against the sale of obscene publications, prints, &c.

CAMPBELTOWN, a royal burgh and seaport of Argyllshire, near the extremity of Cantire, on its eastern side. The town is built in the form of a crescent at the head of Kilkerran Loch, which is about 2 miles long and 1 broad, and forms an excellent harbour with from 6 to 13 fathoms water; it also possesses a pier and quay. At the entrance of the loch is the conical island of Devar, by which the harbour is well sheltered. The population of the burgh in 1881 was 7558. There are several churches and chapels in the town, also an atheneum, town house, and gaol. Its chief trade is in whisky, of which over a million gallons were distilled in the seventeen distilleries of the parish in 1881. Another industry is that furnished by the herring fisheries. The number of vessels registered in 1883 was 14 (2700 tons). The entries and clearances average 1000 (80,000 tons) per annum. The chief imports

are barley, coals, timber, and iron; the principal exports are whisky, black cattle, sheep, and farm produce. Steamers ply regularly between this place and Glasgow, about 65 miles distant. The town is of great antiquity, and has a beautifully carved market cross, supposed to have been brought from Iona. Campbeltown takes its name from that of the family of the Duke of Argyll, who elevated it, in 1700, from a fishing village to a royal barge; it is now a favourite sea-side resort. Together with Avr. Inveraray, Irvine, and Oban, it unites in sending one representative to the House of Commons.

CAMPEACHY, a town of Mexico, formerly the principal seaport of Yucatan, but now the capital of the new state of Campeachy. It has 17,000 inhabitants, churches, convents, a cemetery, a college, a theatre, and shipbuilding docks, and is fortified. Its harbour, which is protected by a breakwater, is shallow, but it is the centre of a large trade in logwood, or "Campeachy wood," cotton, wax, tobacco and hides. The town, which possesses many interesting relics of its former Indian inhabitants, was founded by the Spaniards about 1540. It was captured from them by the English in 1659, and played a successful part in the revolution of 1812.

CAMPEACHY WOOD. See LOGWOOD.

CAMPERDOWN, a village in the Netherlands, 27 miles N.W. of Amsterdam, celebrated for the victory gained off here by Admiral Duncan over the Dutch fleet, 11th October, 1797.

CAMPINE or **CAMPENE**, the purest of turpentine rectified by distillation with quicklime, and used in lamps for illuminating purposes. It gives a brilliant light, but the flame is smoky and requires a strong draught. Ordinary oil of turpentine contains a portion of resin formed by exposure to the air, and this renders it unfit for the purposes of illumination. When quite pure camphine is a hydrocarbon ($C_{10}H_{16}$). It is miscible with alcohol, and the solution may also be burned in ordinary Argand lamps.

CAMPHOR is the crystalline substance obtained from the *Camphoromum camphora*, belonging to the order Laurineæ, and a native of Japan, China, and Formosa. It exists in all parts of the plant—the root, stem, branches, and leaves. It is usually extracted from the wood, which is chopped into pieces sufficiently small to be thrown into iron vessels with water; these vessels are afterwards covered with cotton hoods, in which are placed reeds and rushes, heat being subsequently gradually applied. The camphor is volatilized, and condenses on the reeds and rushes. This, after being purified from the intermixture of reeds, is found in commerce under the name of crude camphor. In Sumatra and Borneo it is not prepared by distillation, but is extracted in a solid crystalline form from the stem of an altogether different tree, a species of *Diospyros*. In that part of the stem which should be occupied by the pith it is found dense with a resinous substance, the trunk being split open the camphor is found in the centre, in pieces about a foot long, which are much prized and used in the East, but is not sent to Europe. Camphor is an organic substance of a peculiar kind, representing the volatile oils in a solid state. It differs from them, however, not only in being solid at the ordinary temperature of the air, but in not being converted by the oxygen of the air into a resin. It is so volatile that on exposure to the air it is entirely volatilized, and leaves no residue. It is soluble in 1000 parts of water, but is very soluble in alcohol, also in acetic acid and oils. It is inflammable, burning with a very smoky flame, and has a peculiar odour and taste. Its formula is $C_{15}H_{10}O$. It forms beautiful colourless crystals by sublimation. It melts at 175°C. (347°Fahr.), and boils at 204°C. (399°Fahr.). Camphor, in small pieces, has a curious and very characteristic rotary motion on water, supposed to be due to the rapid evolution of its vapour at ordinary temperatures.

Camphor acts upon the animal frame, both in the state of vapour and in the solid state, as a powerful stimulant, and is employed in low fevers as a remedy; and also in cramps, epilepsy, and some other nervous diseases. The use of camphor as a preventive of infection in cases of fever is doubtful, and tends rather to favour the morbid action which it is intended to prevent. An artificial solid camphor, having the smell of the ordinary article, has been obtained by mixing oil of turpentine with hydrochloric acid in a vessel surrounded with ice. [See TURPENTINE.] The crystalline camphor obtained from Dryobalanops is known as Borneol or Borneo camphor. See DRYOBALANOPS.

CAMPHOR-OIL, a volatile oil obtained from *Camphora camphora* by distillation with water. It has a strong odour resembling oil of lemon, and boils at 180° C. (356° Fahr.) Its formula is $C_{10}H_{16}O$, and it forms a crystalline compound with lymonic acid. As it exists in the plant it holds camphor in solution.

CAMPHORIC ACID ($C_{10}H_8O_4$). This acid, prepared from camphor by oxidizing it with nitric acid, is obtained in small colourless scales or needle-formed crystals. Its taste is at first weak, but is afterwards acid, and finally bitter. At usual temperatures it is molten, but when gently heated it evolves an odour of camphor, which eventually becomes penetrating and acid. It melts at 70° C. (158° Fahr.) to a colourless fluid, which crystallizes on cooling. It is sparingly soluble in water, but very soluble in alcohol and ether. It forms a series of well-defined salts called camphorates.

CAMPUS MARTIUS, the name of the open plain just outside the walls of ancient Rome, between the Tiber and the Capitoline, Quirinal, and Pincian Mounts. It is chiefly level ground, and little higher than the river. After the expulsion of Tarquinius Superbus it was consecrated to Mars, and became a suburban place of resort for the citizens, for whose evening strolls, hasty walks, a racecourse, a manumitted slaves, &c., were successively constituted. The election of the consuls and other magistrates in the Comitia or Assembly of the Centuries (*Comitia Centuriata*) was held in the Campus Martius in the time of Cicero, and much of the canvassing took place there. Under Augustus the walls of the city were extended, and the Campus Martius was included within them. It was included in the "region" of ancient Rome called *Regio Flaminia*. The name of Campo Marzio is now applied to one of the fourteen Rioni or districts of modern Rome, which forms the northern part of the old Campus Martius, between the Pincian Mount and the Tiber, and includes the fine entrance into the city by the Porta del Popolo, and that part of the Corso nearest to the Piazza di Spagna, where most foreigners reside, the Villa Medici, and the new gardens on the Pincian Mount, the port or quay of Ripetta, the palace Borghese, and the largest theatre of Rome, which is used for bull-fights and fireworks, and which is built on the ruins of the theatre of Augustus. This district is the most bustling in modern Rome.

CAM WOOD is another name for BAR-WOOD. It is used in dyeing and also in cabinet work.

CANA OF GALILEE, a village of Palestine, about 5 miles N.W. of Nazareth, celebrated in the Bible as the place where Jesus wrought his first miracle, by turning water into wine (John iv.). It was also the birthplace of Nathanael (John xvi. 29). Its modern name is *Kefr Kanna*.

CANAAN, the name usually applied in the Old Testament to the territory given to the children of Israel. See PALESTINE.

CANADA BAL'SAM is a turpentine from the balm of Gilead fir (*Abies*). It is highly yellow, transparent, possesses an agreeable odour, and an acid taste. When fresh it flows readily and is turbid, but in time solidifies, and in doing so becomes bright and clear. Its index of refraction is 1.532. It turns a polarized ray of light to

the right. It is used for cementing together the various parts of many optical instruments, and is of peculiar value in the Nicol prism. Total reflection only takes place when a ray of light escapes from a more refracting to a less refracting medium, but it always, under these circumstances, takes place when the obliquity is sufficient. Now, the refractive index of Iceland spar is for the extraordinary ray less, and for the ordinary ray greater, than for Canada balsam. An able optician named Nicol, taking advantage of this, cut a crystal of Iceland spar in two halves in a certain direction. He polished the severed surfaces and reunited them by Canada balsam, the surface of the union being so inclined to the beam traversing the spar that the ordinary ray, which is the most highly refracted, passes from a more refracting to a less refracting medium on passing from the spar to the balsam, and is therefore totally reflected; whilst the extraordinary ray passes from a less refracting to a more refracting medium, where reflection cannot occur, and consequently issues at the other extremity of the instrument. Canada balsam is used also for mounting microscopic objects.

CANADA, DOMINION OF. The name Canada—a corruption of *Kanata* or *Kannatha*; an Iroquois word, signifying a collection of huts—has had in history a variety of meanings. Originally, and up to 1759, it embraced an almost boundless extent of country, under the dominion of France, extending from Acadia (Nova Scotia) and the great Gulf of St. Lawrence as far as the Mississippi River and the Gulf of Mexico. This was the "New France" of the early French explorer, missionary, and merchant adventurer. It was subsequently limited to a region lying chiefly on the borders and banks of the great lakes and the river St. Lawrence, extending from Quebec westward to Lake St. Clair, and known as the basin of the St. Lawrence. Near the close of last century it was divided into two provinces—Ontario and Quebec—and these, until 1840, were known respectively as "Upper" and "Lower" Canada. The two were then united under one government, and this was Canada from 1840 to 1867. Under the British North American Act, passed in the latter year, all the North American colonies were gradually united into one dominion, which includes ONTARIO, QUEBEC, NEW BRUNSWICK, NOVA SCOTIA, NORTH-WEST TERRITORY, PRINCE EDWARD ISLAND, MANITOBA, KENYATIN, and, BRITISH COLUMBIA. In fact, omitting Alaska, the north-west section belonging to the United States, and NEW MEXICO, which has not joined the confederation, the entire north of the American continent, where distances may be measured by thousands of miles, both in the direction of meridians of longitude and parallels of latitude, is included within the dominion of Canada. Its limits are the Atlantic Ocean on the E., the Pacific and the meridian of 141° on the W., the Arctic basin on the N., and the parallel of 49° in its extension from Vancouver's Island to the Lake of the Woods to the S. This southern frontier-line then passes to the great lakes and through their centre. It descends with them to a lower latitude, ascends to the parallel of 45° along the St. Lawrence, and then follows a tract of high ground on the southern side of the stream, proceeding by a very circuitous route to the river St. Croix, by which it is continued to the Bay of Fundy. In the latter part of it, course it separates Quebec and New Brunswick from the States of New York, Vermont, New Hampshire, and Maine; and through its entire extent it is a dividing-line between the territory of a monarchy on the north and a republic on the south. Within the boundaries named there is an area of more than 3,100,000 square miles, nearly equal to the whole extent of Europe; and though much of it is, by rigour of climate and sterility of soil, not permanently habitable by civilized man, and must continue a mere hunting-ground, there is a vast extent of useful space remaining for the accommodation of an immense population. Important

insular dependencies adjoin the continental territories on the east and west, and on the north the islands and archipelagoes of the frozen zone, to which British enterprise has penetrated, belong by right of discovery to the British crown.

Although now politically, as well as nominally, united under the same government, laws, and commercial regulations, the manners and customs of the people still greatly distinguish them. Thus, while Ontario is distinctively British, Quebec is as distinctively French in the nationality of its inhabitants. Ireland has contributed by far the largest share to the whole population, Scotland coming next, and Germany fourth. The German settlements are mainly in Ontario and Nova Scotia. British Columbia, Manitoba, and the North-west Territories contain by far the largest proportion of Indians, and British Columbia almost the only Chinese.

It would be impossible to compress within the limits of one brief article all the features of interest attaching to so vast and diverse an area, and separate descriptive accounts will therefore be found under the several divisions of the Dominion. We can only indicate here in general terms the leading physical, political, and commercial characteristics.

Physical Geography.—The Dominion presents every possible variety of surface, as well as every description of climate, soil, and product. Its leading topographical, geological, and botanical features suggest three great regions, into which it may very properly be divided. These are the elevated or *woodland*, the middle or *prairie*, and the western or *mountain* regions. Timber, and to a smaller extent minerals, distinguish equally the Atlantic and Pacific slopes of the continent, while the interior is largely adapted for agricultural and pastoral purposes. Starting from the Atlantic frontier of the maritime provinces, we find the Cape Breton highlands skirting the sea coast, and extending inland 15 or 20 miles. This dislocated range of metamorphic hills nowhere assumes the height of mountains. Sixty miles inland from this sea board, and nearly parallel thereto, the Coquid Mountains, some of which are 1100 feet high, traverse Nova Scotia from the Bay of Fundy to the Strait of Canso. This range is clothed with a large growth of timber to its summit, where agricultural products grow luxuriantly. The third mountainous range of moderate elevation traverses the boundary between Quebec and New Brunswick, from the State of Maine to the Gulf of St. Lawrence. The east coast of Labrador is also mountainous. The mountain formations of the country lying between the Gulf of St. Lawrence and the Rocky Mountains assume a different direction from the lower mountain ranges just referred to. The country presents a terraced character, and the navigation of the principal rivers and streams is obstructed by numerous falls and rapids. On either side of the valley of the St. Lawrence the country is also mountainous. The range on the north side is called the Laurentides; it extends westwardly from the Labrador coast up the north side of the Ottawa River to the Arctic Ocean, a length of 3500 miles. It forms the water shed between the tributaries of the St. Lawrence and those of Hudson Bay, rising to the height of 2000 feet near Lake Superior. The southern, or south side range, called the Notre Dame Mountains, is a spur of the Alleghanies, which, commencing at the Gulf of St. Lawrence, run nearly parallel to the river St. Lawrence, reaching their greatest elevation of 1000 feet on the Gaspé peninsula, and terminating in Virginia. The Blue Mountains, on the south side of the Georgian Bay, attain a height of 1900 feet above the waters of Lake Huron. Westward of Lake Superior, stretching to the Rocky Mountains, is the great wheat-producing tract, now everywhere recognized as the "fertile belt." Some peaks of the Rocky Mountains rise to the height of 15,000 feet. Between the Rockies and the Pacific coast intervene the Selkirk Mountains, and the Gold Coast or Cascade ranges, the highest points of which reach an elevation of 7000 feet.

In the vicinity of Cariboo and the sources of the North Thompson River, some peaks of the Selkirk Mountains reach a somewhat higher elevation.

Rivers, Lakes, &c.—The area covered by the water-system of Canada embraces about 700,000 square miles. The coasts of the Dominion are everywhere numerously indented. The most remarkable of these indentations form the extensive inland seas known as Hudson Bay, the Gulf of St. Lawrence, and the Gulf of Georgia.

Owing to her remarkable physical configuration and extensive water-shed, Canada possesses the largest lake and river system in the world. The hydrographical basin of the St. Lawrence, with the great lakes Superior, Huron, Michigan, St. Clair, Erie, and Ontario, alone occupies 330,000 square miles. These lakes and their tributary streams form the largest and purest continuous system of fresh water in the world, and impart to the Dominion a perfectly unique hydrographical character.

The areas of the principal features of this great water-system are as follows:—

	Square miles.
Lake Superior covers	13,500
" Huron "	16,500
" Michigan "	13,500
" Erie "	10,000
" Ontario "	12,000
River St. Lawrence and estuary.	52,500
	—
	112,000

Lake Superior, the true source of the St. Lawrence, is the greatest fresh-water lake in the globe, measuring over a curved line drawn through the centre more than 100 miles in length; its extreme breadth is 175 miles, and its circumference, following the sinuosities of the coast, about 1710 miles. Its surface, according to a rough calculation, is above 13,000 square miles, and is 627 feet above the tide water in the Atlantic; but its greatest depth descends below it, being 752 feet. It receives the waters of many small rivers. It is studded with numerous islands, of which the largest is Isle Royal, and its shores have many bays and inlets. The west end of the lake is connected by a cut or portage with the upper waters of the Mississippi, and St. Mary's Strait conveys the waters of Lake Superior to Lake Huron. The country around Lake Superior is cold and dreary. There are numerous islands and a formidable rapid in the St. Mary channel. Lake Huron is only second to Lake Superior in extent; its greatest length is a curved line between St. Mary's Strait and its outlet to the Gulf, 240 miles; its circuit exceeds 1000 miles. The surface is 595 feet above high water in the Atlantic, and its greatest depth exceeds 400 feet. It is divided into two unequal portions by a series of islands, called Manitoulin Islands, and by a peninsula, called Ojibwa Head. One of these Straits is 72 miles in length. The smaller portion of the lake is named Georgian Bay. The larger portion is very deep; it has few islands, the shores are in many parts rugged, and it receives a few rivers. It communicates by the Strait of Machinistiquia with Lake Michigan, which is nearly 300 miles long, with an average width of 75 miles, and is very deep. Its form is elliptical, and tolerably regular, and its shores are of moderate height. The river St. Clair issues from the south point of Lake Huron, and runs into a small lake, called Lake St. Clair, which communicates with Lake Erie by the river Detroit. Lake Erie is 265 miles long, and 63½ broad at its centre; its circumference is computed at 658 miles, and its surface is 565 feet above the sea. Its greatest depth is about 100 feet, with a rocky bottom. The southern shores are low, and there are but few harbours. Some small islands lie near the western end. The waters of Lake Erie descend to Lake Ontario by the Niagara River, which is about 33 miles in length, and contains many

small islands. About 20 miles from Lake Erie occur the Niagara Falls. Above the falls the banks of the river are very little elevated above the water's edge, but below the falls the current flows rapidly in a bed several hundred feet deep, and walled in on both sides by perpendicular rocks. The cut at consists of two falls, divided from one another by a small island, called Goat Island. The fall on the American side is 162 feet high and 375 yards wide. The fall on the Canadian side is 700 yards wide and 149 feet high. The face of Goat Island measures 330 yards. The whole breadth of the river at this point is 1105 yards. Five miles lower down is a very strong eddy, called the Whirlpool; and 5 miles below it the river emerges from the rock-bound chasm, and flows in a deep and gentle current between banks of moderate elevation. At some very remote period the falls were probably much further to the north, between the villages of Queenstown and Lewistown, but the rocks have gradually given way to the original friction of the rapid current, and receded to their present situation. Lake Ontario extends nearly W. and E. in an elliptical shape, measuring in length 172 miles, and in circuit 167 miles; the depths vary from 3 to 100 fathoms. Its surface is 234 feet above the tide-water in the Atlantic. The shores are mostly low, and afford good harbours at Toronto and Kingston. The Genesee, the Oswego, and a few other rivers enter the lake on the United States side. The St. Lawrence, here called the Cataract, expands into a noble stream below Lake Ontario. At one part it forms the Lake of the Thousand Islands; at another the Lake St. Francis, at a third the Lake St. Louis, and at a fourth the Lake St. Peter, all of which are expansions of the river, studded with islands. Impetuous rapids frequently interrupt the navigation of the river. At Montreal the Cataract changes its name to the St. Lawrence, and thence flows in a noble stream nearly 600 miles to the Atlantic. The expansion of the river towards its mouth is enormous. At Quebec the width is under a mile; at Saguenay, 18 miles; at Mont Pelé, 25 miles; at Seven Islands, 73 miles; and at Cape Rozier, 105 miles. The water is brackish nearly up to Quebec, and perfectly salt 75 miles lower down. At the mouth of the river is the island of Anticosti. If we consider Lake Superior as the true source of the St. Lawrence, the length of the river, including a curved line drawn through the centre of Lake Superior, and extending to Cape Rozier, at the mouth of the St. Lawrence, is 1859 miles.

The water is excellent waterway throughout the whole of its length, the rapids being avoided by a series of canals.

The lake system of Ontario and of the central or prairie region embraces, among many smaller bodies of water, Great Slave, Great Bear, Athabasca, Winnipeg, Manitoba, and Winnipegosis Lakes, the Lake of the Woods, and Lakes Superior, Nipigon, and Nipissaug.

Next to the St. Lawrence, the most important rivers of the Dominion are the Saskatchewan, Mackenzie, Peace, Nelson, Athabasca, Assiniboine, Albany, Churchill, and Winnipeg, all flowing in the vast North-west Territory; the Columbia, Fraser, and Thompson in British Columbia; the Ottawa, which forms the boundary between Ontario and Quebec; the Red, and its chief tributaries the Gatineau, Madeline, Repentine, and Matawan; the Saguenay, Richelieu, St. Maurice, and Chambly, in Quebec; the St. John, Muskeg, Rediger, and Petite-de-la, in New Brunswick; the St. Charles, St. Mary, La Have, Ayon, and Annapolis, in Nova Scotia; and the York and Hillsborough rivers in Prince Edward Island. Only the better known of these rivers have been alluded to, any considerable extent with steam craft.

Salt and other mineral springs are very numerous and well distributed, while in no part of the Dominion, save perhaps in a few of the small arable land sections in Eastern British Columbia, is irrigation practised or found to be necessary.

Climate.—The summers and winters are equally decided, and in some interior sections are rather trying to those accustomed to milder and more equable temperatures. The heat of summer and the cold of winter are greater than in England. On the whole, however, they are found to be remarkably dry, bracing, and healthy. A March east wind in England is infinitely more chilling and depressing than 30° of frost in almost any part of Canada. In a country the size of Europe almost every variety of climate and range of thermometer are experienced. It has been urged, and justly, that the climate of a country which perfects the production of the most valued grains, grasses, fruits, plants, timber, and animals—including man—cannot be other than a good one. That of southern interior Canada is greatly influenced by the vast extent of her lake waters. Temperate latitudes are, it is everywhere admitted, requisite for the highest development of animal life, and the climate of that portion of Canada which borders on the Upper St. Lawrence and the great lakes is temperate. Ontario enjoys an exceptionally temperate climate, while that of Quebec and the North-west Territory resembles that of Norway. The meteorological service forms a branch of the General Department of Marine and Fisheries, the Central Office and Magnetic Observatory being at Toronto. In daily correspondence with it are ten principal stations in various parts of the Dominion.

Observations, extended over a period of years, have established 44° as the mean annual temperature of Ontario, while that of the British Isles is 48°. The almost insular character of Ontario protects it from the extremes of heat and cold experienced in the western provinces and territories. The prairie region west of Ontario and east of British Columbia has a mean summer temperature of 60°, with abundance of rain. During winter from 50° to 60° of frost are frequently registered. Throughout the coast regions of Nova Scotia, New Brunswick, and British Columbia the range of the thermometer is not nearly so great; the climate is also more moist and changeable.

The general distribution of rain is more uniform, and snow falls to a much greater depth and lies much longer throughout Canada than in the British Isles. It must be borne in mind, however, that snow serves a most valuable economic purpose in Canadian husbandry in quickening the soil. More than this, it makes good sleighing, and sleighing is the glory of Canadian winter life.

Industries and Land System.—Agriculture, including stock and dairy farming, has long been the chief industrial interest of the Dominion. Next to this rank the products of the forest and the manufactures connected therewith; after these the fisheries and the mines. As more intelligent and thrifty immigrants hope to become landowners sooner or later, it is important that they should, as soon as possible, make themselves acquainted with the system of buying, holding, improving, selling, or transferring land. There are no laws of primogeniture and entail, and the transfer of land is cheap and easy. In the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and British Columbia, the grant of 100,000,000 acres to the Canadian Pacific Railway alone excepted, the lands are held by the several provincial governments. All public lands in Canada, as in other parts of the empire, are called "crown" lands, *i.e.* are held by the crown in trust for the people. Dominion lands are surveyed in blocks of 12 miles square. These are subdivided into four townships of 36 miles square each; these again into thirty-six sections of 1 mile square, or 640 acres each; and each section into quarters of 160 acres each. Each township, therefore, contains 23,040 acres, and each block 92,160 acres.

They may be bought to the extent of 640 acres at 4s. 2d. sterling per acre, cash down. Unoccupied Dominion lands are leased to neighbouring settlers for cutting hay, &c., but not to the hindrance of the sale or settlement of

such lands. Timber and mineral lands are subject to special regulations; and improved farms (advantageous for tenant-farmers newly arrived and unacquainted with the country and its requirements) may be purchased in almost every part of the Dominion. Such farms are either partially or entirely cleared of timber and under cultivation, with dwellings and farm-buildings on them, and are therefore at once available for agricultural purposes. The prices of such range from £4 to £40 per acre, according to situation and productiveness.

Canada is the only British colony, excepting Queensland and West Australia, that grants land *free* to settlers. Quarter sections (160 acres) of untenanted Dominion lands—in all the provinces—are granted to any person who is the head of a family, or to any person not the head of a family who has attained the age of twenty-one years, on condition of three years' settlement from the time of taking possession and the payment of the entry fee of 10 dols. (£2 1s. 3d.) In the North-west Territory the settler has the privilege of purchasing 160 acres more in the neighbourhood of his homestead.

Agriculture forms the chief and abiding interest and industry of the Dominion. That farming pays in Canada is sufficiently proved by the fact that more persons are engaged in it than in any other branch of industry.

Canada now produces annually 40,000,000 bushels of wheat, and a total of 170,000,000 bushels of all crops. When the wheat-fields of the north-west are fairly under cultivation, say before the close of the present century, Canada will probably have a wheat surplus for export of 100,000,000 bushels—sufficient to supply the deficit in the present wheat consumption of the United Kingdom. Agriculturists and farm labourers need not carry implements with them, as these can be more cheaply obtained in Canada, and better suited to their special requirements.

Pastoral farming, which includes stock-raising and dairy-farming—next to agriculture—is the most important industry of Canada, both soil and climate being favourable for its prosecution. Grasses, it is well known, thrive best in the region of summer rains and moderate summer temperatures—*e.g.* in the middle and higher parts of the temperate zone. The high quality of Canadian dairy produce is everywhere acknowledged. Ontario and the eastern townships of Quebec offer perhaps the best openings for those wishing to engage in this branch of business. Manitoba and the North-west Territory will, however, offer increased advantages as soon as railway communication is established through them. The quality of the wool, mutton, and beef raised on the grasses of the north-west prairies is even finer than that produced in the eastern provinces and townships. Cheese and butter are extensively exported. The foot-and-mouth disease, and cattle epidemics generally, are unknown throughout the Dominion. During recent years the pastoral industry has acquired additional interest from the direct trade in beef and cattle which has sprung up with England.

Fruit may be profitably grown in favoured districts only, such as the Annapolis valley in Nova Scotia, in the Niagara and western districts of Ontario, and in the southern and more sheltered sections of the St. Lawrence valley.

Minerals.—Canada, having an extremely diversified geological formation, is rich in minerals. In the Laurentian region the mineral deposits are especially extensive. Though in every way subordinate to her fertile fields and grand forests as a source of wealth, her mineral deposits must, as capital and labour make their influence felt in the country, attract increased attention and development. No single province—except, perhaps, Prince Edward Island—is without mineral deposits. Nova Scotia and British Columbia are rich in coal and gold. The following ores have been worked: gold, silver, copper, lead (galena), iron (magnetic, hematite, chromic, and titanite), coal (lignite

and albertite), apatite (phosphate of lime), graphite, mica, barytes, asbestos, slate, gypsum, petroleum, rock-salt, antimony, iron pyrites, and manganese. These minerals are not confined to any one province, but are found deposited in one form or another, and in greater or lesser quantities, in every part of the country, from the Atlantic to the Pacific. Gold has been found and successfully worked, though in a small way, in Nova Scotia, British Columbia, Quebec, and in the Marmora and Madoc districts of Ontario. The method thus far pursued has been that known as "quartz" mining.

Silver is known to exist in several sections of the Dominion. By far the richest deposits hitherto found have been on the north shores of Lake Superior, south of the Thunder Bay section of the Canadian Pacific Railway.

Iron exists everywhere throughout the Laurentian ranges. Nova Scotia takes precedence, so far, of all the other provinces in the extent and value of her coal and iron mines. They have both been successfully worked for many years. There are some thirty in operation on the mainland and in the island of Cape Breton, and they yield on an average 1,000,000 tons annually. New Brunswick ranks next. The Madoc (Ontario) and Quebec mines exhibit an annually increasing output of iron, but the difficulty of obtaining coal for smelting purposes, and the substitution, as far as practicable, of charcoal, is found to operate unfavourably to its extension. British Columbia is rich in coal and iron, and the coal-mines of Vancouver give employment to a large amount of capital and labour. Anthracite coal of fair quality is found on Queen Charlotte Island.

Petroleum, or coal-oil, abounds in South-west Ontario, and is largely "pumped" and manufactured on the line of the Great Western and other railways in that province. The oil-bearing rock—Lower Devonian limestone—is largely distributed over the western peninsula.

Canadian copper is noted for its purity. Mines have been opened along the shores of Lakes Huron and Superior, and in the eastern townships of Quebec copper-mining is also extensively carried on.

Salt wells and springs are abundant in New Brunswick, and in some portions of Ontario.

Peat abounds in Quebec, in the Island of Anticosti, and in some parts of Ontario.

Forests.—British North America contains probably the most extensive and most valuable forests of timber in the world. Fully one-half its entire surface is still covered with timber. Only the square timber is exported; the logs are manufactured into lumber at home.

The Canadian forest-growth includes between sixty and seventy varieties of wood. Of these the best known and most widely esteemed are the white pine and white spruce. The white birch and cedar are also common. The latter is considered as perhaps the most remarkable wood in the Canadian forest, on account of its lightness and durability. Of the remaining Coniferae, the fir, sometimes called "var" by the settler, and the cedar, are the most prized. Belonging to the Betulaceae are the white, yellow, and black birch. The first is invaluable for its bark, out of which many a canoe and many a sung tent have been made; the two last serve admirably for fuel. The maple adds its charm to the many autumn attractions of the Canadian forest. Of this tree there are two well-known varieties, the rock or sugar maple and the white maple. The "bird's-eye" and "curly" maple, so much employed in the manufacture of furniture, are varieties of the rock maple. It also furnishes the best of fuel, and is the "Yule-log," so to speak, of Lower Canada and the seaboard provinces. The white oak, the beech, the white and black ash, the white and rock elm, hickory, poplar, butter-nut, sumach, and the black walnut—the last-named only found in Ontario—complete the list of the better known Canadian woods. Ginseng, the root of a

small plant (*Panax quinquefolium*), and a grain like rice (*Zizania aquatica*), are indigenous. The root ginseng is about the size of the finger, and has a taste like that of licence, with a slight bitterness; it is exported to China, where it is regarded as a remedy for every ailment. One of the most important shrubs is sumach (*Rhus coriaria*), whose shoots, clipped or ground, are used for dyeing. Large tracts of the country are still covered with forests, which, for the majesty of their tall trees, their vast extent, and desolate grandeur, and for the gorgeous tints which they exhibit when the first touch of decay has passed across their foliage, are unparalleled in any other part of the world. In the decline of autumn two or three frosty nights suffice to change the verdure of the forests into every possible variety of hue. No language can adequately describe the gorgeous beauty of the woodland. In winter, again, when a heavy fall of snow is followed by a thaw, or a misty rain falls, the next frost coats the trees with transparent ice, and in the sunshine all vegetable nature glitters with myriads of sparkling crystals.

The timber is felled by wood cutters, who form what is called a "lumbering party." These lumberers, suitably equipped, proceed up the rivers in the autumn to the place fixed on as their winter establishment, which is selected as near a stream as possible. They commence by clearing a space of ground and building a shanty or camp of logs, seldom more than 4 or 5 feet high, with a roof covered with birch bark or boards. The floor is strewn with straw, hay, or fir branches, on which the men sleep with their feet next the fire, which is kept in all night by those who chance to wake. The winter is spent in unremitting toil, and no course of life can be more laborious or unremitting to the constitution, yet the wild freedom connected with it is refreshing, and when once adopted it is preferred to any other. As soon as the rivers swell, from the melting of the snows in the spring, the cut timber is thrown into the water and floated down by the powerful current until the stream becomes sufficiently wide to arrange the logs in distinct rafts, which are sent to the St. Lawrence.

Fauna. The fauna comprises the bear, fox, beaver, otter, marten, squirrel, marten, weasel, lynx, mink, racoon, wolverine or caribou; several species of the deer tribe, as the caribou, the musk-rat, wild cat, &c. The puma, or American lion, whose proper home is the central region of the continent, is sometimes met with both here and in Patagonia, its range being thus more extensive than that of any other quadruped. Remains of the elephant have been recently found on the gravel ridge north of Lake Ontario, which seems to have been dry land when much of the country was submerged. Snakes abound, among which are the rattlesnake and adder; and there is a vast variety of birds, of which many have very gay plumage. In summer two species of humming-birds wander as far north of their native region as the gardens of Quebec. The lakes and rivers are stocked with an abundance and variety of fish, surpassing that of most countries.

Population.—The population of Canada at the last census, as compared with that of 1871, was as follows:—

	1871.	1881.
Prince Edward Island,	94,021	108,928
Nova Scotia,	387,800	410,385
New Brunswick,	285,594	321,329
Quebec,	1,191,516	1,358,469
Ontario,	1,620,851	1,913,460
Manitoba,	12,728	49,509
British Columbia,	33,586	60,000
North-west Territory,	66,500	100,000
Total,	3,686,596	4,332,080

The census of 1881 showed that the population of Canada had increased by 665,484 in the ten years, and

included the following nationalities:—Africans, 21,394; Chinese, 4,383; Dutch, 30,412; English, 881,301; French, 1,298,929; Germans, 255,319; Icelanders, 1009; Indians, 108,517; Irish, 957,403; Italians, 1819; Jews, 667; Russians, 1227; Scandinavians, 4214; Scotch, 699,863; Spanish and Portuguese, 1172; Swiss, 4588; Welsh, 9947; all others, 43,587.

As is the case in the United States, the white race is rapidly spreading over regions where, until recent years, the Indians were almost the exclusive occupants. The vast territory which once belonged to the Hudson Bay Company, now included in the Dominion as the North-west Territory, is fast changing the nature of its products. Under the company it yielded little except furs, and was stoutly held to be incapable of yielding anything else. A country thus long declared hopelessly sterile by the only authorities who could be supposed to know anything about it has been better explored, and found to be just the reverse of what it was persistently asserted to be. Emigrants are beginning to press into it, and each year brings them in continually larger numbers. Canada is thus moving in parallel steps with the United States. The course of emigration is westward with both of them, and above and below the boundary line the same process of settlement is going on, and there is an almost infinite potentiality of growth in the future. The present population may be multiplied many times over, and there will still be room remaining for emigrants from the Old World. It should be borne in mind that the best lands of Canada have been left to the last.

Manufactures and Commerce.—The manufactures of Canada are as yet in their infancy, and are chiefly confined to articles of primary necessity. Immense quantities of lumber, in the form of boards, planks, staves, deals, masts, spars, laths, oars, shingles, and land-pikes, are made and largely exported. There are some cloth, woollen, and linen manufactures in both provinces, and large quantities of whisky are distilled in Upper Canada. Shipbuilding also forms an important and increasing branch of industry in many parts. The internal trade is much facilitated by several magnificent canals and about 7000 miles of railway. Canada ranks nearly third—certainly fourth—in importance among the shipowning countries of the world; the vessels on the registry books of the Dominion in 1883 exhibited a total of 8500, measuring 1,360,000 tons.

The foreign trade is chiefly with the United States and Great Britain, the greater part of the imports being derived from Great Britain, but the greater part of the exports being sent to the United States. In 1882 the value of the exports was 79,323,667 dollars, and of the imports 91,000,000 dollars. The trade between the countries now included in the Dominion and the United Kingdom from 1880 to 1882 was as follows:—

Years.	Imports to Great Britain.	Exports from Great Britain.
1882,	£9,783,700	£9,111,329
1881,	11,695,676	8,592,280
1880,	10,472,955	8,100,616

Wood is the principal article received from Canada, its annual value now averaging about £1,000,000. Wheat, maize, pearl-ash, and butter are the articles next in importance. The chief articles imported from the United Kingdom are apparel, cotton and woollen goods, and iron manufactures.

Revenue.—The revenue is derived mainly from customs, excise, a duty on licenses, interest on investments, and sale of lands; but there are a great many other small sources of income. Its amount has varied within the last few years from £4,500,000 to £7,150,000 sterling; the expenditure is sometimes in excess, and there is a public

debt of about £10,000,000, which includes the debts of the separate states, assumed at the date of the federation, the interest of which is over £1,500,000 sterling. The greater portion of the debt has been incurred for the construction of roads, canals, railways, lighthouses, and other valuable public works, all essential to the development of the country, and many of them sources of revenue.

Army and Navy.—The imperial troops in the Dominion are stationed in Halifax, Nova Scotia. The Dominion army consists of an active militia of 37,000 men, and a reserve of 656,000. The active militia is furnished from eleven military districts, of which four are in Ontario, three in Quebec, and one in each of the others, in quotas proportional to these numbers. It consists of volunteers, whose duties, however, only exact of them some sixteen days' drill annually, either continuously in camp, or at the weekly night parades of the local regiments. In time of war, or threatened danger, they are, of course, liable to continuous service, together with the marine militia, comprising all men serving on board the sailing vessels and steamers on the lakes and rivers. The navy consists of a few gunboats on the lakes, which are not usually under commission, and some five or six screw steamers employed in protecting the fisheries of the Gulf of St. Lawrence, &c.

Religion and Education.—There is now no state church in the Dominion, or in any part of North America; but all sects of the mother country are represented, and there are others not known in Great Britain. Formerly both the English and Scottish Established Churches were connected with the state in Canada, as in the mother country; they had endowments out of funds accruing from lands set apart for the purpose, and called "the clergy reserves." The Methodists and some other Protestant bodies also received small grants out of these funds. On the disestablishment of the churches in 1851 a commutation fund was formed out of these reserves, and compensation made to the several churches in the following proportions: Half to the English Episcopal Church, a fourth to the Scottish Established Church, and the remaining fourth among the other former recipients of state bounty. These latter applied the sum which came to them to various church purposes, leaving nothing to their successors in office, no doubt in the belief that endowments had an injurious tendency. The ministers of the Scottish Kirk funded their portion for the benefit of their successors, the incumbents at the time of the commutation receiving £80 per annum, those to be after admitted £10 per annum, the extension of the church being thus provided for. Most of the churches have also glebes and mansees. The original capital was £80,000; but of this a large sum was lost by unfortunate investments, and strenuous efforts have been made to replace it by subscriptions. The portion of the Protestant Episcopal Church is chiefly devoted to support the sees of the bishops, which are fourteen in number. The main support now in all the Protestant churches is from the voluntary contributions of the congregations. The Roman Catholic Church owns large property in the province of Quebec, and in the adjoining parts of Ontario; and has moreover, by treaty, the power of imposing "tithes" on their own adherents in the eastern province; the "tithe," however, is not a tenth but a twenty-sixth of the cereal crops. The church has several archbishoprics and eight bishoprics. Education is made an object of great national importance; and there are considerable endowments from landed property, the gift of the state and individuals, and from bequests. Taxation, imposed by the local authorities, who manage the schools by committees of the ratepayers, gives a large additional yearly income. The Bible is very generally read in the public schools, but education is largely secular. Roman Catholics have "separate schools," at which the children of such of their communion as decline to make use of the public schools may be educated. There is ample provision

for the higher education in a graduated system of schools, ascending to the colleges. Of the latter, the principal are—University College, Trinity and Knox College, Toronto; Huron College, London; Victoria, Cobourg; Queen's University, Kingston; McGill, Montreal; Bishop's, Lennoxville; Morin, Quebec; Dalhousie, Halifax; and the College of New Brunswick, Fredericton, N.B. A number of normal schools exist in the various provinces. The common schools are free in Ontario; in some of the other provinces a small fee is charged. Justice all over the Dominion is administered by courts constituted like those of Great Britain.

The following were the numbers of the different sects according to the census of 1881: Roman Catholics, chiefly in Quebec, 1,791,982; Methodists, 742,581; Presbyterians, 676,152; Church of England, 574,818; Baptists, 225,236; Adventists, 1211; Free-will Baptists, 50,055; Mennonites, 21,231; Brethren, 8831; Congregationalists, 26,900; Disciples, 20,193; Episcopal (Reformed), 2596; Jews, 2393; Lutherans, 46,369; Pagans, 4478; Protestants, 6519; Quakers, 6533; Unitarians, 2126; Universalists, 4517; no religion, 2634; other denominations, 14,269; not given, 86,769.

History and Government. Canada was first discovered by John and Sebastian Cabot in 1497. In 1525 it was visited by Verazani, a Florentine, who took possession of the country for the king of France. In 1535 Jacques Cartier, bearing a commission from the French king, explored the river St. Lawrence, which he so called from his having first entered it on St. Lawrence's Day; but it was not until 1608 that the first permanent settlement was formed by the French under Champlain, on the spot now occupied by the city of Quebec. Quebec surrendered to the English under Kirk in 1629, but was immediately restored to France, peace having been established with that country in April of that year. In 1663 the colony was constituted a royal government, and the governors were thenceforth appointed by the king. Canada continued a possession of France until 1759, in which year Quebec was taken by General Wolfe, and the province was ceded in full sovereignty to Great Britain by the treaty of Paris in 1763. From that time until 1774 the affairs of Canada were regulated by the ordinances of the governor alone; but in that year, under an Act of Parliament called the Quebec Act, a legislative council of twenty-three members was appointed by the king. In 1791 the form of government was again altered; the executive power was continued in the governor appointed by the crown, and two legislative chambers were formed.

This constitution was suspended in consequence of the rebellion, in Upper Canada, in 1838, and a special council appointed. In 1840 the two provinces were reunited by the Act 3 & 4 Vict. c. 35, and the legislative councils of the united provinces were consolidated. The new legislative council consisted of twenty members, appointed by the governor for life; while the people were represented in a House of Assembly, comprising eighty-four members, returned in equal proportions by the inhabitants of Upper and Lower Canada. A modification of the constitution took place in 1853, and in 1867 all previous laws on the subject were repealed by the "British North American Act." Under this Act the formerly separate provinces of Canada, Nova Scotia, and New Brunswick were joined under one constitution, and assumed the title of the "Dominion of Canada." In 1869 the right of government of the vast fur-hunting grounds of Rupert's Land and of the Hudson Bay Territory was purchased from the Hudson Bay Company, and were placed under the government of the Dominion of Canada, and renamed the North-west Territory. The company, however, continues its trading operations without restriction, and retains a small space round each of its stations. The lieutenant governorship of Manitoba, in the basin of the Red River, was formed out of a small part of this territory in 1870. In the following year British

Columbia and Vancouver Island, on the Pacific slope of the continent, also joined the Dominion, and Prince Edward Island was added in 1873.

The constitution of the Dominion is modelled on that of the United Kingdom; the Parliament consisting of the queen (represented by a governor-general with a salary of £10,000 per annum), an upper house, styled the Senate, and a House of Assembly or Commons. The governor-general exercises his authority with the aid and advice of a council, called the Queen's Privy Council for Canada, and chosen from time to time by himself.

The Senate comprises seventy-seven members, nominated for life by the governor-general, being twenty-four from the province of Ontario, twenty-four from Quebec, ten from Nova Scotia, ten from New Brunswick, three from British Columbia, and four from Prince Edward Island. Every senator must have real property to the value of at least 4000 dollars, and must be a resident of the province for which he is appointed. Under certain circumstances a member of the Senate is required to vacate his seat; thus, if he fail to attend in his place for two consecutive sessions, or if he become a citizen of another power, or be adjudged bankrupt, or be convicted of felony or other more grievous crime, or lose his property or residential qualification—in each case his seat becomes vacant, and a successor is appointed by the governor-general. The House of Assembly comprises 213 members, chosen in as many electoral districts or boroughs—ninety-three for Ontario, sixty-five for Quebec, twenty-one for Nova Scotia, sixteen for New Brunswick, five for Manitoba, six for British Columbia, and seven for Prince Edward Island. The numbers are to be altered in proportion to the population, after every decennial census—the proportion being one to every 17,000. Clergymen of all denominations are incapable of becoming members.

The House is elected for five years, but may be previously dissolved by the governor-general, in which case a new election takes place immediately. At least one session must be held annually, so that a period of twelve months may never elapse between each meeting of the legislature. The right of the franchise is enjoyed by all males of mature age possessed of a small property qualification, and is somewhat lower in rural districts than in cities and towns. Voting is by ballot. In the Dominion Parliament the members of both houses receive a sessional allowance of 1000 dols. (£200), and ten cents (*5d.*) a mile for travelling expenses. The speaker of the House of Assembly is elected by the members, while the president of the Senate is appointed by the crown for life.

The executive is vested in a governor-general, styled "Governor-general of British North America," and appointed by the crown. The governor-general has the power to give or withhold the royal assent to bills passed by the Senate and House of Assembly, or to reserve the same till the royal pleasure be expressed. Such bills as are assented to by him in the name of the crown are, nevertheless, subject to disallowance by the sovereign, within two years after the receipt of authentic copies by one of the principal secretaries of state in Great Britain; and no bills reserved for the consideration of the crown can have any force unless the royal assent be signified within two years after they have been presented to the governor-general.

Each province has a legislature and executive to conduct its local affairs, presided over by a lieutenant-governor appointed by the governor-general. Under the control of the Parliament of the confederation are placed those questions which affect the country at large, such as the national debt and matters affecting the trade and commerce of the country, and the raising of the revenue not only by direct, but also by indirect taxation. In the same way all questions connected with the currency, coinage, banking institutions, shipping, navigation, har-

bours, quarantine, and the collection and issue of statistics are intrusted to the general Parliament, who have also to deal with all criminal legislation. Such questions as agriculture, immigration, and public works are decided on by the local and confederate Parliaments concurrently.

The arrangement, completed in 1871, of uniting the whole of the North American possessions into one confederation has been found to work greatly to the advantage of the Dominion at large, and it enabled Canada to enter upon a new and vigorous existence. The resources of the country are on an enormous scale. It contains not only the richest but the largest extent of wheat-growing land, and one of the largest coal-fields in the world, and needs only the one element of a large industrious population. This the colonial government is doing its best to encourage, by the construction of useful public works which will, in every way, facilitate the opening up of the country. A railway across the continent, connecting the Atlantic and Pacific, is now under construction, and will probably be opened in 1885. Postal and telegraphic convenience extends to every village in the Dominion; and law and justice are administered with a steadiness which leaves no room for complaint. Nowhere in her Majesty's empire are life, property, and the blessings of a settled government more secure; and for the emigrant of the class we have already indicated work is plentiful, and with industry and patience any man may be sure of success.

CANAL' (from the Latin *canalis*, a tube or pipe) is a name given to any artificial channel filled with water, whether for the purpose of drainage, irrigation, the supply of a town with water, or inland navigation. Ancient Egypt was intersected with canals, which were used both for navigation and irrigation; and in China they have been in use from before the Christian era. The first made in Europe appears to have been that cut by Xerxes across the low isthmus of Athens. The Romans made canals in Italy and the Low Countries, about the outlets of the Rhine, and probably also in Britain.

In a level country the cutting of a canal is comparatively easy, though even in such a country difficulties may arise from the nature of the soil or from an insufficient supply of water. Where the soil consists of sand, gravel, loose rock, or other matter through which the water will percolate, the floor and sides of the canal must be covered with an impervious lining, called *puddling*, which generally consists of light loam and coarse sand or fine gravel, well mixed with water, and applied in a semifluid state, in three or more successive strata, each carefully worked into the preceding, to the thickness of about 3 feet. The puddling is then covered with common soil to the depth of 18 or 24 inches. As a further security against the escape of water, *mud* or *puddle-ditches* or *gutters* are sometimes formed along the sides of the canal. They are ditches about 3 feet wide, dug perpendicularly to a depth below the bottom of the canal, and gradually filled with puddling stuff to a few inches above the top water-line. When the banks are raised above the natural level, if the soil be of a porous nature, their stability will be aided by covering them with turf.

When the canal passes through an uneven country it must often be conducted in a very tortuous course to maintain the level; and deep cuttings, tunnels, embankments, and arched or iron aqueducts must be introduced where the level of the canal is unavoidably much below or above the natural surface. Canal tunnels are usually of smaller transverse dimensions than those found on railways, though this is not invariably the case; but many are of great length. That at Blisworth, on the Grand Junction Canal, is 3080 yards, or 1½ mile long; that on the Thames and Medway Canal, which has been converted into a railway tunnel, is about 2½ miles; one on the Leominster Canal at Pensax is 3850 yards, or nearly 2½ miles; and the Marsden Tunnel, on the Huddersfield Canal, is 5451 yards, or upwards of

3 miles long. The tunnels or excavations on the Duke of Bridgewater's Canal, which is conducted by several channels into the heart of a coal-mine, are said to be altogether 18 miles long. Telford introduced, for situations where a canal is greatly elevated above the surface, aqueducts formed of cast-iron plates screwed together by means of flanges, and supported upon piers or pillars of masonry. The first aqueduct of this kind was that for carrying the Shrewsbury Canal across the Fern valley at Long Mill; but the most extensive and remarkable is the Pont-y-Cysyllte, which carries the Ellesmere and Chester Canal over the Dee at an elevation of 125 feet above the bed of the river. The trough or aqueduct is 988 feet long, 20 feet wide, and 6 feet deep; and it is supported by nineteen pairs of stone pillars, 52 feet apart.

Unavoidable changes of level are usually overcome by *locks*, the invention of which has been disputed by the Dutch and the Venetians. Leonardo da Vinci is said to have applied them in 1497 to the Milanese canals. A lock is a chamber of masonry occupying or constituting the bed of the canal between the upper and lower levels, at the point where it is desired to transfer boats from one to the other, and furnished with gates at each end, and with sluices communicating with both the levels. When a boat is to be passed from the lower to the upper level, the water is suffered to escape from the lock until its surface coincides with the lower level. The gates at the lower end are then opened, and the boat is floated into the lock. The sluices which communicate with the upper level being then opened, the level of the water in the lock is raised until it coincides with the upper level of the canal. The upper gates are then opened, and the boat is floated out of the lock. The operation of lowering a boat is precisely the reverse. Every time the operation is performed, a quantity of water, equal to the contents of the lock, is lost from the upper level. To make this loss as small as possible, locks are made only just wide enough to admit the widest boats used on the canal; and in some cases two are formed side by side, with a communication between them, so that, whenever one has to be emptied, one-half of its contents may be transferred to the adjoining one, and saved for a future occasion. This arrangement also saves time. Inclined planes, up and down which the boats may be conveyed on trucks or sledges, have in a few cases been used as substitutes for locks.

The usual mode of moving boats upon a canal is to *tow* or draw them by means of a long rope, by horses driven along a raised *towing path* formed along one bank of the canal. To save expense the older canal bridges were made so small that it was necessary to detach the horses on coming to them, and to get the boats through by manual labour, or by mere impetus; but on the best modern canals the arches are made large enough to include a towing path as well as a waterway. The same remark applies to tunnels. In several of the older tunnels the boats were forced through by the laborious and dangerous process of *legging*, which was performed by men lying upon their backs on the boat, and thrusting their feet against the sides or roof of the tunnel. In some cases ropes or chains worked by steam-engines have been used for hauling boats through. Steam has of late years been successfully introduced in the propulsion of canal boats. The first attempts made to propel them by steam-power were open to the fatal objection that paddle-wheels of every kind were found to injure the banks by their action, but by the application of the screw propeller this objection has been obviated. The plan of towing in Holland and Belgium, which has been found very successful there, and which it has been suggested might be introduced into this country, is as follows:—A wire rope is laid in the bed of the river or canal from end to end, and is anchored only at the two extremities; an engine fixed on a screw tug takes hold of the rope by

means of only a clip drum, round which the rope is passed. The drum, when put in motion by the engine, winds itself along the rope, and at the same time tows the barge or barges to which the tug is attached. As the tug moves on the rope falls back to its place in the bed of the canal.

The origin of canal navigation in Great Britain dates from 1755, when an Act of Parliament was passed for constructing a canal about 11 miles long from the mouth of Sankey Brook, on the Mersey, to Gerrard's Bridge and St. Helens. Before this was completed, the Duke of Bridgewater [See BRIDGEWATER, DUKE OF] commenced his canal between Worsley and Manchester, in the construction of which BRINDLEY exhibited that engineering skill which led to his subsequent employment in making several of the canals, which before the introduction of railways remained the principal arteries of inland communication. During the remainder of the eighteenth and the earlier years of the nineteenth centuries, the construction of navigable canals was carried on with vigour, until they were made in England alone to an aggregate length of more than 2200 miles. In conjunction with new canals, many rivers have been artificially rendered navigable, so that it has been asserted that no spot in England, south of Durham, is more than 15 miles distant from water communication. The total length of canals now open in Great Britain is about 5000 miles, including all the branch lines and junctions. The introduction and rapid extension of railways almost entirely put a stop to the construction of canals, and in several instances they were drained and occupied by railways; but the newer and swifter mode of transit has by no means entirely superseded their use for the conveyance of heavy goods.

On the contrary, it very early occurred to Parliament that canal companies might be made to compete effectively with the railways, and that public benefit would arise from such competition. It is not to be doubted that, for many kinds of traffic, canals are much better suited than railways ever can be. For all heavy articles, when expedition is not an essential of the conveyance, canal carriage is well adapted; and considering the much greater cheapness of conveyance by water than conveyance by rail, the competition might, it would seem, have proved very real and effective. Indeed, at the present time, sea competition with railways is very active for goods, and railway companies convey goods to and from seaports at much lower rates than they carry similar goods from or to inland towns. And if the public who use the railways derive a great indirect benefit from the competition of ships upon the sea with the lines of railways running to ports, it is only reasonable to expect that similar advantages would accrue to inland towns if canal waterways could be made to compete with railways. Such views were anticipated by the railway companies, and they managed to become the owners of important links in the canal system of England, and by the imposition of what are technically called "bar-tolls," prevented the easy transit of traffic along the navigations of which they were the owners. They also failed to keep the canals in proper repair, allowed the supplies of water to fall off or be used for other purposes, and so drove the traffic off the canals on to the railways. The companies evidently had a keener knowledge of their own interests than the government had of the public requirements and necessities. The latter, however, have received more recognition in the legislation of recent years, and railway companies are now permitted by Parliament to possess canals only under effective guarantees that the waterways shall not be made subservient to railway interests.

Much attention has recently been called to this subject by well-grounded complaints of the heavy railway rates charged between Manchester and Liverpool, and it has been proposed to meet the difficulty by the construction of a ship canal between the two cities. Two schemes were

suggested, one a tidal waterway right through to new docks to be built in Manchester; the other to utilize the tide only as far up the Mersey as Latchford, and thence to Manchester—a distance of some 15 miles—to construct a ship canal of the ordinary type, with locks. The promoters of the scheme favoured the latter plan as being the least costly and most practicable. The course of the proposed canal was to be provided for the most part by deepening and straightening the channels of the rivers Irwell and Mersey. The latter river, which below Stockport divides Lancashire from Cheshire, meets the Irwell, the river of Manchester, at Carrington, near Irlam, 7 miles below that city. Above their junction the Irwell is the larger river of the two. The joint stream is next enlarged by the Glazebrook, from the Lancashire "mosses," and by the Bollin, from Cheshire. It becomes considerable at Warrington, an important town on the right bank, 18 miles from Manchester by rail. The Mersey below Warrington continues enlarging itself down to Runcorn, the port of the Duke of Bridgewater's Canal, which was opened in 1767. Here the width of the river suddenly contracts to 400 yards, and is spanned by the fine viaduct of the London and North-Western Railway. But immediately below Runcorn the Mersey enters a very large estuary, where it is joined by the Weaver, a Cheshire river with a considerable volume of water. The estuary, from Runcorn to the sea, is about 16 miles long, and in some parts 2 or 3 miles wide, but narrows at Liverpool to three-quarters of a mile. Its course forms a large curve, bending northward as it approaches the sea, which is reached at Bootle, on the Lancashire shore; the opposite shore, in Cheshire, becoming open sea-coast at New Brighton. The upper reaches of this estuary are encumbered with mud; and it was proposed to dredge a navigable channel from Garston to Runcorn, and to protect it by training walls, like that part of the Suez Canal which runs through Lake Manzalah.

From Runcorn up to Manchester the winding course of the Mersey and Irwell, for the most part, would have to be corrected by cutting a new channel for those rivers, which would be made broad and deep. It would not be a tidal river above Warrington; there would be locks in three places—at Walton and Latchford, near that town; at Irlam, and at Barton, 4 or 5 miles from Manchester. These locks would form three "pools," of the lengths, respectively, of 8, 4, and 3 miles. The bottom width of the canalized portion of the river would be 100 feet, with a depth of 26 feet. The tidal portion, below Runcorn, would be 24 feet deep at low tide.

The principal dock at Manchester would be on the Salford side of the Irwell, occupying the ground used for the racecourse, nearly opposite Trafford Park. It would have an area of 79 acres, and would be entered by gates 80 feet wide. The dock would gradually widen to 1350 feet, terminating in four branch docks, with wide quays between them, and sheds for the storage of goods. The whole length of the proposed navigable channel, from the sea to the Manchester dock, was just 50 miles, and throughout it would be very much wider and deeper than the Suez Canal.

A Bill was introduced into Parliament in 1883 giving powers to form a company for carrying out this scheme. It passed the House of Commons with some amendments intended to protect the rights of those interested in the Mersey estuary, but was rejected by the House of Lords. The promoters, however, were indisposed to relinquish their design, and instructed their engineers to draw up fresh plans, omitting the items which had excited the strongest opposition. In the amended scheme the design of carrying a deep water channel protected by training walls through the estuary of the Mersey was given up, and the outlet of the canal was placed at a point near Eastham Ferry, where, through tidal locks, it would communicate with the salt

water. The canal would then pass from this point in one level stretch up to the Latchford Locks, crossing the mouth of the river Weaver and Ellesmere Port, at both of which points gates would be provided to enable vessels to pass through the canal into the estuary. The site of the docks at Manchester was also changed, and it was proposed to make the principal jetties and basins on the site of the Pomona Gardens, the river Irwell being enlarged and deepened for this purpose. The amended scheme was brought before Parliament in 1884-85, and the Bill was submitted to the consideration of a select committee of the House of Lords, but up to the time of writing the present article no decision had been arrived at. A map of the original scheme will be found at the commencement of this volume.

The work would not, for the age, be much more extensive than was the Gloucester and Berkeley Canal, one of the greatest works of the last century. The city of Gloucester is on the banks of the Severn, and it has a capacious dock with many large warehouses and yards for American and Mediterranean produce, but the dock itself has no communication with the Severn except through a canal with an outlet into the river 20 miles down.

Under the Canal Boats Acts of 1877 and 1884, all canal boats, barges, and flats must be registered, marked, and numbered before they can be used as dwellings, and the certificate of registration fixes the number of persons allowed to dwell in the boat or barge. Provision has to be made by the owner for proper ventilation, and for the separation of the sexes. Children living in a canal boat or barge are subject to the compulsory clauses of the Education Act, which are in force at the place to which the boat is registered as belonging.

The Suez Canal, the greatest work of this description in modern times, was constructed under the direction of M. de Lesseps, a gentleman originally connected with the French diplomatic service, and was successfully opened in November, 1869. At the beginning of the present century the practicability of cutting a ship canal through the isthmus suggested itself to many French engineers, and for many years they were engaged more or less on the contemplation of this problem. The first Napoleon regarded his magnificent Egyptian expedition as a stepping stone to the acquisition of power in India; Marseilles and Alexandria were to be the chief points on the great highway; and a canal across the Isthmus of Suez was to open a ship course thence to the coveted Indies. His defeat in Egypt checked his scheme; but Frenchmen ever after felt a warm interest in some such project. The French engineers, taking levels across the isthmus in 1799, arrived at an opinion that the level of the Mediterranean was 30 feet below that of the Red Sea near Suez, and this formed the basis for many of the subsequent plans for cutting a canal across the isthmus. It was conceived that, if a small canal was made, the force of the water running through it from the Red Sea to the Mediterranean would by degrees enlarge it to dimensions suitable for ships. Many men of science denied that there could possibly be such a difference of level. At length, in 1817, one part of the problem was set at rest. France, England, and Austria agreed to send out a commission to measure accurately the levels of the two seas. The commissioners—M. Tadmor, Mr. Robert Stephenson, and M. Negrelli—found that the *two seas have exactly the same mean level*, thus nullifying the theory established nearly half a century before. The only difference noticeable was that there is a tide of 6½ feet at one end and of only 18 inches at the other. Mr. Stephenson, very early in his examination of the isthmus, came to the conclusion that a really practicable ship canal across it could not be made. He thereupon planned for the pasha a railway from Alexandria to Suez via Cairo; this was opened in 1858, and conveyed all Indian and Australian mails overland across the isthmus until 1868, when it was

superseded by a more direct route between the two towns. The French, however, were not satisfied with Mr. Stephenson's decision; nor, in fact, did they very much relish the introduction of English influence into that region. M. Talabot, on his return to Europe, developed the plan of a ship canal, and published it in detail in the *Revue des Deux Mondes*. While this was being considered, however, another Frenchman, M. de Lesseps, set to work in a way of his own. Being engaged in diplomatic service in Egypt he was in friendly communication with the pasha, and he made use of this advantage to obtain from him the concession of a ship canal from Tyneh to Suez; that is, the exclusive privilege of forming such a canal. M. de Lesseps at once employed two French engineers to prepare detailed plans, and the scheme which was then presented to the world was a sufficiently formidable one. A canal was to be dug, 90 miles long, 330 feet wide at the water-line, and sloping at the sides down to the bottom, which was to be 20 feet below low-water level in the Mediterranean. A sluice lock, 330 feet long by 70 wide, was to be formed at each end; and by taking advantage of the rise of the tides at Suez, it was expected or hoped that an additional depth of 3 or 4 feet might be obtained. The more formidable portions of the work would be two artificial harbours, necessary to be constructed at the ends of the canal, seeing that no ship could enter it from the sea except through a harbour protected at all times from sands and shoals. At Suez the piers would have to be carried out to the length of 3 miles, in order to inclose a harbour deep enough for such a purpose, and would have to pass through shifting sand; but still the stone to construct them was near at hand, and the difficulties were only such as engineers are accustomed to deal with. At the Mediterranean end of the canal, however, near Tyneh or Pelusium, the indispensable harbour would be considerably more difficult of construction, and much more costly. The Nile annually pours out 30,000,000 cubic yards of sand and mud into the Mediterranean, besides that which is deposited on the land of the Delta, or Lower Egypt. This enormous quantity is borne by a current directly towards the shore of the Mediterranean near the region of Tyneh, making the sea at that spot shallower and shallower every year, full of shifting mud and sandbanks. The engineers ascertained in 1847 that in order to obtain a permanent depth of water sufficient for a ship drawing 23 feet, the piers of this harbour at Tyneh would require to be carried out to the extent of 5 miles. The quantity of stone requisite to form them was variously estimated at from 3,000,000 to 12,000,000 cubic yards, and there is not a stone quarry of any kind within many miles from Tyneh.

Years rolled on, and nothing definite was arranged. It would take far more than our space will allow to tell of the opposition, coldness, and rebuffs which the intrepid projector had to encounter. His own sovereign was indifferent, but in England the hostility was almost rancorous. In the leading journals, especially the *Times*, a perfect shower of articles ridiculed the scheme, and prophesied that, if ever it was made, the canal would be only a "stagnant ditch," which would speedily fill up with sand. Lord Palmerston bitterly opposed the project, and Robert Stephenson himself, in Parliament, repeated in contemptuous style the favourite phrase "stagnant ditch." That the nation which would make most use of the canal should have offered such vigorous opposition to the project is not very surprising, when we consider the vast interests affected by the revolution it was destined to make in the carrying trade to the East.

In 1855 the nations that would be most benefited commercially by the opening of a canal across the isthmus—France, England, Austria, Prussia, and Holland—were invited by the pasha to send out a joint commission of civil engineers to test the plans of Lesseps and Talabot,

and to report upon the feasibility of the whole project. After they had made their report, a larger commission, appointed by the pasha, devoted the greater part of 1856 to a consideration of the matter. The commission came to the conclusion that a canal, differing in certain points from Lesseps' plan, could be constructed with profit. The result of all this was that M. de Lesseps obtained the requisite powers from the pasha, that a company was formed, that the pasha and French shareholders agreed to furnish the funds, and that in April, 1859, the works were commenced, and progressed with few interruptions until their completion.

These works embraced a vast variety of accessories to the undertaking—piers, harbours, light-houses, dwellings for thousands of labourers—in fact, all the appliances of modern civilization in a district which was an utter wilderness, without a blade of grass or a drop of fresh water. The thing could not have been done at all without the prompt and liberal assistance of Said, and afterward of Ismail, who acceded to power in 1863. A subsidiary undertaking, but one which became imperative in the circumstances, was the bringing of fresh water along the desert—a preliminary absolutely necessary before a spade could be turned towards the main canal. The enterprise of the Pharaohs some twenty five or thirty centuries before was now of no small value to M. de Lesseps. At that far distant date they had constructed a canal from the eastern branch of the Nile at Bubastis, now Zagazig, leading very nearly to mid-way in the line of route now proposed to be taken, and thence southwards to the Red Sea. By this means the Egyptians of 3000 years ago had a watery way by which ships could pass to the Nile, and by the Nile to the Mediterranean, as well as communicating with Memphis and Upper Egypt. M. de Lesseps found some portions of the canal still unfilled up, and by the aid of 80,000 labourers, furnished by the pasha, he had it re-excavated, repaired, cleaned out, and refilled with fresh water from the Nile at Zagazig. It was 9 feet deep, 40 feet wide, and small boats went along it with men, sailing necessaries to the workmen when the larger canal was being made. This was also, and still is, the source of fresh water supply to stations along the northern half of the canal and to Port Said. By means of an engine the water was raised to a cistern on the sandy heights called Hadis, near Ismailia. From this a pipe was laid in the sand all the way along the bank of the canal to Port Said, and the water conveyed thence and to intermediate stations by gravitation. It may be stated that the Suez Canal is 99 miles long from sea to sea, and that, roughly speaking, Ismailia is about half-way between Port Said and Suez. The Sweet Water Canal supplies Ismailia and the southern half, and the northern half depends upon the rather fragile pipe conveyance just mentioned. If, in the course of the military operations in Egypt in 1882, Arabi Pasha had cut off the sweet-water supply at Zagazig, it will readily be understood that Ismailia, Suez, and Port Said might have been made very thirsty places indeed. The latter town might have been reduced to sore straits if even a few fanatical Arabs had given a determined wrench to the slender iron pipe upon which 10,000 inhabitants depend for their drinking water.

The works on the great salt-water canal were on a stupendous scale. At one time 285 dredging machines were working with a steam force of 18,000 horses, consuming 12,000 tons of coal per month, while the quantity of stuff lifted and carried off amounted to 2,763,000 cubic yards monthly.

The canal crosses the desert to the east of Alexandria, commencing at Port Said, where the necessary harbour was constructed by running out into the sea two breakwaters formed by blocks of artificial stone made on the spot. It answers the double object of protecting vessels from heavy

seas and of arresting the alluvium brought down by the river Nile in its passage towards the Bay of Pelusia, so as to prevent its choking up the channel. The western breakwater extends from the shore 2400 yards in a straight line towards the north, and then with a slight angle towards the east extends 330 yards further. The eastern breakwater leaves the shore at the distance of 1530 yards of the commencement of the western breakwater, and extends nearly north for a distance of 2070 yards, at which point it is 760 yards from the western breakwater, and this distance constitutes the width of the entrance.

The artificial blocks in these breakwaters are composed of one part of hydraulic lime from France and two parts of sand, and are therefore really very hard mortar. The prevailing winds being from the north-west, large quantities of alluvium are constantly brought along the shore from the Nile, and northerly breezes send this alluvium into the harbour formed by the breakwaters. Consequently to keep the harbour at a sufficient depth, a heavy regular outlay has been found necessary for extensive dredging operations.

As will be seen from the Plan prefixed to this volume, the course pursued by the canal in a southerly direction is for about 31 miles perfectly straight; the width at the surface of the water being 327 feet and 72 feet at the bottom, with a depth of 26 feet. This measurement prevails over 77 out of the 99 miles of the canal; the remaining 22 miles are rather narrower. Passing the forty-first mile, the canal makes a bend to Lake Timsah, the bending being due to the practicability of cutting through some sand hills. Lake Timsah—only a lake by the sea having been let in—may be called the central station. Here, on the west side, we come to Ismailia, with the fresh-water canal and railway from Cairo, both of which continue at no great distance all the way to Suez. The canal further passes through the difficult cuttings of Toussoum and the Serapeum, about 6 miles long, and across the adjacent land to the Great Bitter Lake and the neighbouring Little Bitter Lake, the two together forming a fine sheet of water about 20 miles in length. Like Lake Timsah, they are nothing more than natural depressions in the sand filled with sea-water to the ordinary depth of the canal, the fair way being cleared by dredging. At the seventy-third mile we reach the Chalouf cutting, 5 miles long, through hard rock, from which the canal emerges on to the plain of Suez, and ends at Port Ibrahim, in the Gulf of Suez, a portion of the Red Sea. The work here consists chiefly of an entrance channel into the Red Sea, increasing gradually from 72 feet in width at the bottom to 980 feet, of a basin or dock, and a considerable extent of reclaimed land.

Along the whole route there are defined stations, houses of officials, and the electric telegraph, with mooring posts and other accommodations. To avoid a congestion of traffic, the transit is placed under strict regulations, and usually occupies sixteen hours. At each end the tides exert an appropriate influence. If anything there is a current from the Red Sea; but as it meets a wind from the north, it does not affect the navigation. Fears as to the drifting of sand into the canal have proved to have been greatly exaggerated. Along the sides of the fresh-water canal trees have been planted; these, when grown, will serve to condense the clouds and draw rain; wherefore it is hoped that at no distant date the desert may assume the character of a green and fertile region.

The canal was ready for opening on November 17-18, 1869, on which days the Empress of the French, the Emperor of Austria, and representatives from nearly all the other courts of Europe (but none from England), steamed through its entire length from Port Said to Suez. It was soon afterwards successfully traversed by vessels of all kinds, and in every respect since it has realized the most sanguine expectations formed of it. It has, in fact, become the

highway between Europe and the East. Every 5 or 6 miles a short widening in the canal allows vessels to pass each other with ease. Vessels can pass each other at any part by using warps; but unless they are small, they cannot do so without stopping, except at great risk of running on shore and delaying the whole traffic of the canal.

The expense of the canal was at first estimated at £4,000,000. More careful calculations, however, caused the original capital to be put at £8,000,000. Including the heavy expenditure on Port Said, the graving docks at Suez, and other things of a less or more remunerative character, it is believed that fully £19,000,000 was spent upon the undertaking. The main portion of this heavy outlay fell upon the Khedive of Egypt, without whose enterprise and generosity the great work would probably never have been accomplished. He found half the original capital of £8,000,000, the other half being taken by the general public, chiefly in France. Preference stock at 9 per cent. was subsequently raised to the extent of £4,000,000, and on this, as on the £4,000,000 previously subscribed by the public, interest was paid all the time the works were proceeding—that is, out of capital; and by this gigantic process of robbing Peter to pay Paul the subscribers themselves absorbed, under the name of interest, about £1,000,000 of the nominal capital before any money was earned! The viceroy's shares, on the other hand, were to bear no interest for twenty-five years. Said Pasha also undertook to furnish labour on cheap terms, forced labour in fact; and granted the company large concessions of land at the sides of the canal. In 1864, however, Said Pasha's successor, Ismail, withdrew the forced labour, chiefly in deference to public opinion, and declined to sanction all the large land concessions of his predecessor. By an award of the Emperor Napoleon III., to whom the matter was submitted for arbitration, the khedive had to pay £3,500,000, to the company as compensation for the withdrawal of these privileges. Of the entire sum of more than £19,000,000 expended by the company, the unfortunate khedive became responsible in one way or another for about £10,000,000 with little or no prospect of interest on any portion of it. To this should be added the fact that the canal was to a certain extent really detrimental to his own interests, inasmuch as it considerably detracted from the business of the railway across the isthmus, which belongs almost entirely to the viceroy. The natural consequence of such an extensive drain upon the finances of a country by no means wealthy was embarrassment, and from this the khedive sought to be relieved by selling his shares and prospective pecuniary interest in the canal. He formerly held half the original shares of the company, representing a value of £4,000,000. Previous to 1875, however, he had parted with 1010 of these shares, leaving the number at 176,602, the value of which was £3,976,582. The shares being in the market, the British government, in 1875, made an offer for them to the khedive, which he accepted, pledging himself to pay interest for nineteen years at the rate of 5 per cent. upon the purchase money, until, at the end of that time, the shares will be entitled to participate in the dividends of the canal company. The purchase was brought before Parliament in 1876, and was very heartily sanctioned, the very exceptional step taken by the government being held to be justified by the enormous extent to which British interests are involved in the canal, both in regard to our mercantile navy and to its being the main highway to our Indian empire. The £4,000,000 purchase money was borrowed by the government from the National Debt Commissioners on such advantageous terms that if the khedive meets the payments of the interest, and if the canal continues a 5 per cent. dividend when the nineteen years shall have expired, the whole £4,000,000, both principal and interest, will be repaid by the government in the course of thirty-five years.

The immediate practical value of the canal to the British government itself may be seen from the fact that our Indian troopships now do ten voyages as against eight in the same time as formerly; and that the whole troopship service is performed by four instead of five vessels; while to show the great utility of the canal to our mercantile interests generally, it may be mentioned that British ships furnish upwards of four-fifths of the whole tonnage which passes through it.

There seems another side, however, to this view, for a paper issued by the Board of Trade in 1883, comparing English trade to and from the East in certain particulars with what it was before the Suez Canal was opened, suggested that after all the canal may have been on the whole a cause of loss rather than of gain to English trade. Of the general benefit to the world arising from facilities of communication there can, of course, be no doubt: but this is quite consistent with the fact, if it is such, that English trade in particular has been a loser. It appears that freights have not been lowered by the canal; for the canal company, it must be remembered, by the levying of heavy transit dues, confiscate to their own advantage the greater part of the saving effected by the substitution of a short water-route for a longer one; and the chief gain to trade has been a saving of 1 per cent. in insurance, which, it is more than likely, is due not to the canal, but to the general substitution of steamers for sailing vessels. On the other hand, British entrepôt trade, which is very profitable, has suffered. There is now a direct trade between the East and the Mediterranean countries of Europe, amounting to over £5,000,000 annually, which has come into existence since the opening of the canal, and which is undoubtedly a diversion from our entrepôt trade. The difference to us may not be much either way, putting all things together, but it seems quite certain that British trade is not a great gainer by the work of M. de Lesseps.

As to the ability of the Suez Canal Company to continue to pay a handsome dividend there seems little doubt, judging by the fact that its traffic continues steadily to increase—as will be seen from the following figures:—

Year.	No. of Vessels.	Gross Measurement Tonnage.	Receipts. Francs.
1871, . . .	765	761,467	8,993,732
1872, . . .	1082	1,439,169	16,407,591
1873, . . .	1173	2,085,072	22,897,319
1874, . . .	1264	2,423,672	24,859,383
1875, . . .	1494	2,940,708	28,879,735
1876, . . .	1457	3,072,017	29,974,998
1877, . . .	1663	3,418,949	33,490,435
1878, . . .	1593	3,291,535	31,098,800
1879, . . .	1477	3,236,942	30,000,000
1880, . . .	2026	4,344,000	40,300,000
1881, . . .	2727	5,794,000	54,676,000
1882, . . .	3198	7,122,125	61,928,905
1883, . . .	3307	8,051,307	67,592,420
1884, . . .	3284	8,319,961	61,402,084

These figures, while they show how the canal is used, also show that the traffic is growing at a rate which will soon be beyond the capacity of the narrow waterway. Indeed, it has lately been found to be altogether unequal to the demands made upon it. The tendency is to very big ships, and these pass each other slowly and with difficulty, sometimes running aground, and causing costly delays.

The nominal value of Suez Canal shares is 500 francs. They were quoted at only 450 francs in 1861, and rose gradually to 875 francs in 1875. This was the year of the purchase of 44 per cent. of the shares by the British government, and they then rapidly rose till, in 1883, the 500-franc shares were quoted at 3500 francs each. In the latter year the British government recognized the need of a second canal as being of so urgent a nature that an

arrangement was entered into by which £8,000,000 were to be advanced on loan at nominal interest by this country towards its construction. In consequence, however, of an opinion very generally expressed, that sufficient advantages had not been secured for British shipping—which amounted to four-fifths of the entire traffic—the proposals were withdrawn. So strong, nevertheless, was the feeling manifested by British shipowners that it was even proposed to contest the rights of the Canal Company to a monopoly of water communication across the Isthmus of Suez, and in the interest of the company itself negotiations were opened between M. de Lesseps and a representative committee of British shipowners. These finally led to the Canal Company undertaking to provide additional accommodation by enlarging the canal as early as practicable, and meantime by increasing the number of stations where vessels could pass each other; to increase the number of British directors to ten, three representing the British Government and seven the English users of the canal, in a council of thirty-two directors in all; to open an office in London; and finally, to make certain concessions to customers as regards the rates charged in proportion to the increase of traffic. An international commission of engineers was appointed to report on the best means of widening the canal. The arrangement was agreed to after considerable opposition by the French shareholders.

The success of the Suez Canal gave a strong stimulus to the project for a cutting through the Isthmus of Panama to connect the Atlantic and Pacific Oceans. The route is not greatly longer than that of the Egyptian Canal, but the difficulties are much more serious. At Suez the cuttings were chiefly through sand, and there was an unlimited supply of cheap labour. At Panama the courses lie through swamp or solid rock, the lowest rate of wages is 6s. a day, and even for this very little dependence can be placed upon the natives. The land, moreover, runs so high that some twenty locks and a dozen miles of tunnel were regarded as inevitable. M. de Lesseps, however, whose advice was sought, declined to entertain any scheme involving locks or tunnels, and advocated a broad and deep tide-level ship canal, to extend from the Gulf of Limon to the Bay of Panama. This bold scheme was ultimately adopted, and in 1881 the work was commenced. It was pushed forward in several sections at once, and in spite of the terrible mortality caused by the fevers which always prevail there, the progress which had been made in 1885 left no doubt of the ultimate success of the project.

CANARIES, or CANARY ISLANDS, a group of islands in the Atlantic, lying off the western coast of Africa, and extending between 27° 42' and 29° 25' N. lat., 13° 25' and 18° 16' W. lon. Pliny ("Nat. Hist." vi. 33) gives some account of them, which is taken from the work of Juba, the learned Mauretanian king. He calls the whole group the *Fortunate Insule*, or Happy Islands. The modern name of the group is derived from the name of Canaria, one of the islands, so called according to Pliny, from the number of large dogs (Lat. *canis*, a dog) found there, two of which were brought to Juba. In modern times the first mention of them dates from about the year 1330, when a French ship was driven among them by stress of weather. Two expeditions, undertaken by the Spaniards in 1385 and 1393, with the object of taking possession of the islands, failed in consequence of the resistance of the natives. In the year 1400 John de Bethencourt, a Norman nobleman, sailed from Rochelle with a small force, and landed at Lanzarote, the most easterly of the islands, on which he built a fort. On his return to Spain he obtained from Enrique III. of Castile and Leon a grant of all the islands, with the title of king. In a second expedition in 1405 he made himself master of Lanzarote, Fuerteventura, Hierro, and Gomera; but his attempts on the other islands were foiled by the bravery of the natives. De Bethencourt died in

1408, and was succeeded by a nephew, who sold his title to the islands, in 1418, to Enrique de Guzman. This nobleman exerted himself to complete the conquest of the islands, but without success. The Spaniards went through a form of taking possession of Gran-Canaria and Tenerife for the crown in 1461; but it was not till 1493 that these two islands and Palma were completely reduced, and since that time the Canaries have been always held by the Spaniards. The original inhabitants were called Guanches, of whom little is now known except their bravery and their custom of embalming the dead. They are supposed to have migrated from the mainland of Africa, which is only 50 or 60 miles distant from the nearest island. Owing to intermarriage with their conquerors, the Guanches have ceased to exist as a separate people, and the population may now be considered entirely Spanish, that being the only language now spoken. The inhabitants are a sober, intelligent people, but lazy, uneducated, and superstitious. The prevailing religion is Roman Catholicism. The food of the lower orders consists of potatoes, fish, and a preparation of maize.

The group consists of seven islands—Hierro or Ferro, Palma, Gomera, Tenerife, Gran-Canaria, Fuerteventura, and Lanzarote—and of several small rocky islets, the largest of which are Graciosa and Alegranza. The whole group stands on a bank, but the depth of water between the islands is very great, and the passages are good. They are

all of volcanic origin, and present a surface diversified by rocks, gorges, mountains, and valleys. The coasts are high and precipitous; there are no close harbours, the anchorage being generally open roadsteads. The mountains, which are barren, rocky, and peaked, rise to the greatest height about the centres of the islands, and some of them have their summits covered with snow during the winter. The loftiest height is the Pico de Teyde in the island of Tenerife, being 12,182 feet above the sea-level. The valleys, wherever there is water or any humidity in the soil, are exceedingly fertile, producing grain, vegetables, and fruits and plants, both tropical and European. Formerly these natural products were neglected in favour of the rearing of the cochineal insect, and the export of cochineal was the most important item in the foreign trade. Now that the aniline dyes are so largely used, cochineal has declined in value, and the people have resumed the cultivation of wine, tobacco, coffee, and sugar. Goats, pigs, and sheep abound; and mules, asses, and camels are used as beasts of burden. Fowls, ducks, geese, pigeons, turkeys, and wild birds are very numerous. The area of the islands, which form a province of Spain, is about 400 square miles; and the population in 1883 was 240,000. Raw silk is exported to a small extent, but manufactures from this or any other article are little carried on. The chief trade is with England, France, Spain, Hamburg, and America. There is



The Canary Islands.

also a considerable commerce carried on amongst the various islands, some of whom despatch vessels to the Spanish West Indies. Santa Cruz, in Tenerife, is touched at by the Spanish government steamer, as well as by the African mail boats from England. Of late years cod and various other fish have been caught in large numbers by the islanders. The total value of exports is about £150,000, of which two thirds is to England. The imports are valued at nearly £500,000 per annum—of which over one-third is from Great Britain.

The temperature near the sea is very equable and the climate excellent, but it is disagreeably affected at the beginning and end of the rainy season, i.e. November to February, by the south-west wind called El Levante, which, blowing across the Sahara, is dry, hot, and sultry, and produces great thirst. It sometimes carries clouds of locusts, which commit great ravages on the corn-fields and plantations. Hurricanes, accompanied by water-spouts, though not often encountered, sometimes visit the islands. Although there are numerous mountain torrents, they have no rivers, and in the southern portions of the islands fresh water is sometimes very scarce.

The civil and military government of the Canary Islands is vested in the hands of a governor-general, under whom are deputy and lieutenant-governors. There is a military commander on each island.

CANARIUM is a genus of resin-producing trees belonging to the order *BURSERACEÆ*. There are fifty species, natives of tropical Asia, especially the Indian Archipelago, a few occurring in Africa and the Mascarene Islands. This genus differs from the allied genus *BOSWELLIA* (see

BOTANY. Plate I., fig. 3), in the epicarp of the drupe not coming off in valves; and from *BURSERIA* and *BALSAMODENDRON* in the calyx having generally three divisions, the petals being three to five, stamens six to ten, and the drupe ovoid, three-cornered, with a bony stone.

The name is derived from "Kauai," the Malayian designation of *Canarium commune*, a large tree 40 to 60 feet high, with fruit about the size of a plum. Gumi, a concrete resinous exudation used as an ointment for ulcers, is apparently produced by this tree. From the seed, the "Java almond," a bland fixed oil is expressed, which is employed as a substitute for almond oil. In Java it is used for food, and also for burning. In Celebes bread is made from the seeds.

CANARY BIRD (*Carduelis canaria*), one of the FINCH family (Fringillidae), is a native of the Canary Islands, where, and in Madeira, it is still found wild. It was probably imported into Europe in the beginning of the sixteenth century, being first introduced, according to Bechstein, into the district of Italy opposite Elba, where the birds being set at liberty increased, and would have become naturalized had they not been captured in such numbers that at last they were extirpated from their new abode.

In Madeira, according to Dr. Hume, the canary birds in thick, bushy, high shrubs and trees, with roots, moss, feathers, hair, &c.; it pairs in February, lays from four to six pale blue eggs, and hatches five or six times in a season. He observes that it is very familiar, haunting and breeding in gardens about the city. "It is a delightful songster," says he, "with, beyond doubt, much of the nightingale's and skylark's, but none of the woodlark's

song." The colour of the wild canary is gray or brownish-gray, with a tinge of green; darker on the upper parts, and olive green on the chest.

It is to the effects of food, domestication, and an unnatural state of existence that the plumage of our caged canaries owes its many modifications. Some have been seen pure white; but pale yellow, bright yellow, more or less tinged with orange, yellow mottled, or streaked with brown or black, are the most common. Many have the head crested. Varieties, according to the skill and design of the bird-fancier, are continually produced; and prizes are awarded by the bird-fanciers' societies to the competitors who can show birds nearest to the model published by them the season prior to that wherein the exhibition is to take place. Amateurs distinguish upwards of thirty varieties. Vast numbers of canaries are bred in Germany, and sent over to London and other parts of England for sale.

The canary, as is well known, not only breeds with its own species in captivity, but with other allied species; and these hybrids are more or less in esteem according to their beauty and song. The following mules or hybrids are the most usual:—1, Hybrids between a hen canary and male goldfinch; these are often very beautiful; 2, mules between a hen canary and male siskin; these partake much of the characters of the siskin; 3, mules between a hen canary and greenbird, or citril finch; 4, mules between a hen canary and a linnet; 5, mules between a hen canary and bullfinch; these are extremely rare, but were obtained by Dr. Jassy of Frankfurt.

The song, the habits and manners, and the docility of the canary in captivity are too well known to be described. It may be taught to whistle airs, as it often is in Germany, and even to repeat very short sentences, in a sort of half-whistling voice.

With respect to the best method for breeding canaries, for educating them in music, and for their general treatment, we must refer to Bechstein.

CANARY SEED (*Phalaris canariensis*) is a grass, a native of the Canary Islands, naturalized in Europe, and cultivated in various places. The seed is imported into the south of Europe from Barbary. It is also cultivated in the isle of Thanet and some other parts of Kent. The stems are over 2 feet high; the panicles of flowers are ovate, and compact like a spike; the glumes are large, yellowish, striped with green, and with a wing on the back.

CANCELLI, lattice-work, gives us the very diverse words *chancellor* (*cancellarius*) and *cancellous tissue*. Such lattice work was, in Roman times, very usually placed before a window, a doorway, &c., and especially before the tribunal of a judge as a barrier to keep away the litigants. The person who stood at the imperial grating and the scribe who wrote within were both called *cancellarius*; one developed into the chamberlain and the other became the chancellor, and was invested with judicial power. The other derivative is the subject of the next article.

CAN-CELLOUS TISSUE, or *cancellated* or *spongy tissue*, is the lighter of the two tissues of bone. In reality these do not differ in their nature, for the hard or *compact tissue* forming the shaft or covering the head of a long bone is found to be porous when looked at under a microscope. To the eye, however, the difference is very great, and justifies their distinction. Cancellous tissue forms the inner part of all bones (though of very slight amount in the shafts of long bones), and if minutely observed is found to be made up of slender bars or plates of bone, joined in a reticulated manner, roughly comparable to lattice work (*cancelli*), whence its name. This structure gives considerable strength without weight. The small cells thus made communicate freely, and are filled with marrow or bloodvessels.

CAN-CEER, the name given to a painful and fatal disease distinguished by the presence of certain morbid growths or

tumours. It assails all classes and ranks of society, from the highest to the lowest, is more common in women than in men, and though it may arise at any age, it most frequently appears during the middle or advanced periods of life. The parts of the body most frequently attacked are—the womb, the stomach, and the female breast; but there is scarcely any part that is not liable to this disease.

The chief kinds of cancer are—the scirrhus or hard cancer, the encephaloid or soft cancer, and the epithelial, which generally assails the skin or mucous membranes.

The first of these is a very common form of the disease, its most frequent site being the female breast, but it also occurs in the stomach, womb, tongue, the liver and other glands of the body, the male genital organs, skin, &c. As a rule, there are few premonitory signs of its approach, attention generally being called to it by the appearance of a small tumour. When it occurs in the female breast this tumour generally appears without being accompanied by pain during its onset. It generally, however, increases steadily in growth, the neighbouring parts becoming involved in its structure; and as it progresses, sharp darting pains are felt, the skin over it becoming red and breaking into an ulcerous sore impossible to heal. There is usually during this period deficient appetite, loss of flesh, and failure in muscular power, while the skin acquires a yellow tinge characteristic of this disease. The later stages of the disease are marked by increasing discharge from the wound, the pain increases, and the patient at last dies, worn out by suffering and exhaustion.

The encephaloid, or soft cancer, differs very materially both in structure, appearance, and duration. In appearance and consistence it greatly resembles brain substance, and its most frequent seats are—the mucous membrane of the stomach, the liver, the nose, the eyes, the testicles, and the salivary and mammary glands. It is very rapid in its progress, quickly affects the general health, and from its exhausting discharges generally causes death within two years. Unlike the scirrhus cancer, which rarely appears in young persons, or before middle life, this may occur at any age, but it is most common in the young.

The last mentioned, or epithelial cancer, is largely composed of cells resembling the natural epithelium of the body. It frequently occurs on these places where the skin and mucous membranes adjoin, as the lips, anus, and vulva, and also on the tongue, the upper end of the oesophagus, and on the scrotum. It is generally more local in its nature than the other forms of cancer; it does not spread so rapidly, nor does it so frequently involve other parts of the body.

With regard to the causes which give rise to cancer, there exists very great difference of opinion among medical authorities. Some regard the cancer as being a purely local affection in the first instance, the constitutional disturbance being a result of the morbid condition of the part affected. The more generally accepted theory, however, is that which regards the cancer as the outcome of a certain constitutional condition or predisposition towards this disease. The common notion of a hereditary tendency towards this disease has been proved to have some foundation by medical observation, but it is by no means so strong as is generally supposed. Out of 278 cases of cancer that were investigated, it was found that only in one instance a parent had died of the disease, though other investigations have shown a rather higher percentage. It is sometimes supposed to be the result of a blow or fall; but there does not appear to be much foundation for this belief, except that when there is a latent tendency towards this disease it may become active from such an occurrence. The same thing may be said concerning anxiety or grief, which have been frequently found to have preceded an attack.

With regard to the treatment of cancer but little can be said. When it appears in a part that can be reached by the surgeon's knife, complete excision during an early stage

will sometimes completely remove the disease; but when it has proceeded so far as to affect other parts of the body, an operation is of no avail. When it has become too far advanced for excision, the treatment consists in relieving the pain occasioned by the disease, and in strengthening the patient to bear the exhaustion. There are many soothing applications known to medical science, such as poultices of hemlock leaves or starch, the application of the vapour of chloroform, the use of a lotion made up of the tincture of *Hydrastis Canadensis* and glycerine, or of the chloride of hydrastra and water. When the pain becomes excessive, temporary relief may be obtained by the use of opium, morphia, or chloral. Good nourishment is always necessary.

Some persons profess to be able to "cure" cancer without the use of the knife. As people frequently come to them with tumours that are not of a cancerous character, and which they are able to remove, they are thus enabled to maintain the delusion.

Many people endure much unnecessary suffering from the fear that they are the victims of cancer. In all such cases skilled medical advice should at once be sought. A short examination will often enable the doctor to allay the fears of the patient, and even in those cases where he is obliged to recognize the existence of the disease, it is always best that it should be dealt with as early as possible.

CAN'CEER (the Crab), the fourth constellation of the zodiac, being one of those in Ptolemy. From the end of January to that of April its time of coming on the meridian in this country varies from midnight to six in the evening. In the division of the ecliptic into signs, Cancer is the part of that circle between 90° and 120° from the vernal equinox. The sign of Cancer covers the constellation Gemini (the Twins). The sun enters this sign about the 21st of June and leaves it about the 22nd of July in each year. The first point of the sign marks the summer solstice, and the declination parallel through this point is called the *tropic of Cancer*. The constellation Cancer lies under the sign Leo (the anomaly is explained in the article ARIES), and will be found in our PLATE CONSTELLATIONS (N. Hemisphere 120° to 140° , not far from the circumference). It contains a beautiful closely drawn star-group, called the *Prosepe* (or Bee-hive), in which Galileo counted thirty-eight stars, and our modern astronomers, with their powerful telescopes, number many more. Cancer is but a faint constellation, and suffers by contrast with its neighbours, the brilliant Leo and the Twins. The ancients used it as a weather-glass. If it was clearly visible they hoped for fine dry weather; if it was dim, or not to be seen, they prepared for rain.

CAN'CEER-ROOT is the American name for a native plant (*Epiphegus virginiana*) which has acquired a reputation as a cure for cancer. The whole plant possesses astringent properties. It is parasitic on the roots of beech trees, and like other OROBANCHACEÆ, it is brown and fleshy, with scales instead of leaves. The flowers on the upper part of the branched stem have a large corolla, and both stamens and pistil, but the latter does not often ripen. Those below have a small corolla, and the ovary ripens into a capsule with numerous seeds.

Another plant which goes by the same name is a species of *Conopsea*, nearly allied to *Orobancha*, from which it differs in each flower having two bracts, and the stamens being exserted. These plants are natives of South America, growing clustered together in oak woods.

CAN'DACE (*Kandake*), who is alluded to in Acts viii. 27 as queen of Ethiopia, and whose eunuch, "who had the charge of all her treasure, and had come to Jerusalem to worship," was the subject of the good teaching of the apostle Philip, must not be confused with her famous namesake and predecessor in the kingdom, who invaded Egypt B.C. 22, and for a time made

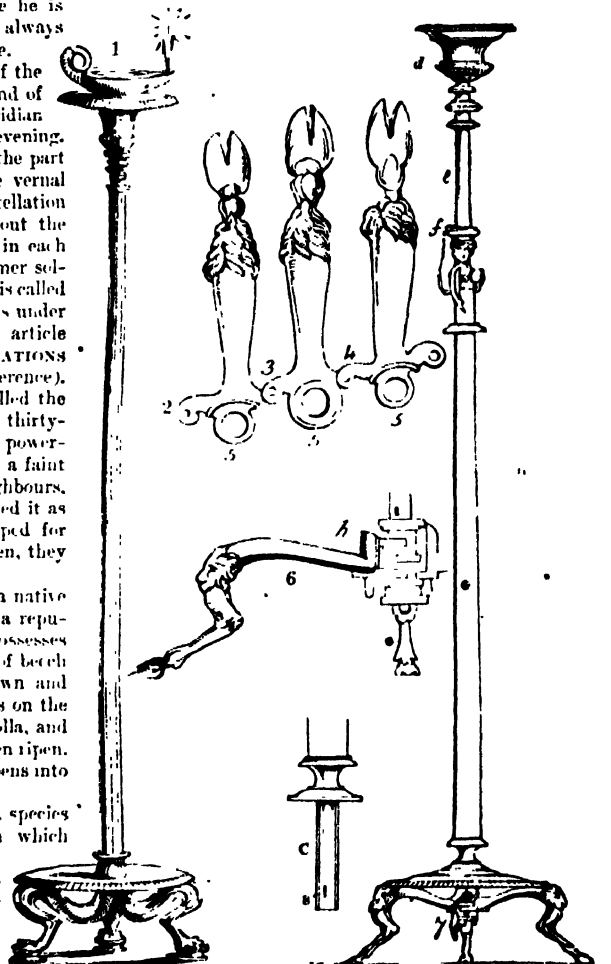
a good stand even against the Roman legions under Ptolemy. There seems, indeed, to have been a succession of female sovereigns of Ethiopia of this name, and the probability is that, like Pharaoh (or the later Ptolemy), it had become almost a synonym for "sovereign."

CANDAHAR. See KANDAHAR.

CANDAU'LES (*Kandaules*) was that semi-mythical Heraclid king of Lydia who has supplied painters from all time with one of their most favourite subjects by his vanity and folly. His queen was reputed the handsomest woman of her time, and he had the incredible folly to indulge his favourite officer, Gyges, by causing the queen to entirely disrobe before him. Herodotus, who narrates the story, does not say whether there had been previous love passages between Gyges and the queen, but no one could be surprised at what followed—viz. the murder of Candaules by Gyges, instigated by the angry queen, the marriage of the two, and their succession to the empty throne. The date given by Herodotus for this is B.C. 716.

CANDEISH. See KANDEISH.

CANDELA'BRUM, an article of furniture used by the Romans both in their public edifices and private dwellings.



Bronze Candelabrum from Herculaneum

Movable Candelabrum; c, movable shaft; 2 to 5, connecting joints of the legs.

The candelabra used in public edifices were usually of a greater size, and made with a large cup, *d*, at the top to receive a lamp or sufficient unctuous material to feed a large flame.

The annexed woodcut represents two bronze candelabra from Herculaneum, one of a simple form, the other in some measure complicated.

The base is formed of three goats' legs, each having a ring at each end, *5, 5, 5*. The centre piece is attached to the side pieces by rivets, *2, 3, 4*, round which these rings are allowed to turn, so that the three lie either parallel when the candelabrum is taken to pieces, or may be made to stand at equal distances in the circumference of a circle, in which case the two exterior rings lap over each other, and are united by a movable pin. The end rings, *5, 5, 5*, which are placed at different heights, as shown at *h*, will then be brought into the same vertical line; and the round pin, *c*, which terminates the stem, passes through them and is secured by a pin, *7*, passing through the hole, *8*, which keeps the whole tight. The shaft is square and hollow, and surmounted by two busts. Within this lower shaft a smaller shaft, *e*, plays up and down, and is fixed at any desired height by the pin *f*.

CAN'DIA. See CRETE.

CAN'DIDATE, our term to express a suitor for popular suffrages for some public office, is directly taken from the Latin. The Roman candidate was clothed in white (*candidatus*), as a symbol of purity, fidelity, and humility, and wore the toga loose, that his scars gained in honourable fight might be seen by the people.

CAN'DLE, a cylinder of tallow, wax, or other fatty matter inclosing a wick, and used as a source of artificial light. The commoner kinds of candles are made of tallow, wax, spermaceti, stearine; the solid portions of palm and cocoa-nut oils, wax, and paraffin being used for those of better quality.

There are two ways of making candles, which are distinguished as *dipped* or *mould* candles, according to the method employed. Dipped candles are made as follows:—Wicks made of spun cotton are selected of a size proper for the intended diameter of the candle, and are cut into the requisite lengths by a simple and convenient machine, being first doubled and twisted so as to leave a loop at one end. Into this loop a smooth cylindrical stick, half an inch in diameter and about 3 feet long, is inserted, and several of the cottons or wicks, being so treated and disposed at regular intervals on the stick, are ready to receive their external coating of tallow. The number of cottons ranged upon each stick varies according to the size of the candles to be made. The tallow, being previously melted and strained, is placed in a kind of a trough, into which the wicks are dipped three times for the first "lay;" after being kept a short time over the trough for the wicks to drain, the sticks are placed on a rack from which the candles hang freely, and are thus allowed to harden. The same process is repeated a second and third time and oftener, according to the required weight of the candles. Where large quantities are to be made, several sticks are placed together in a kind of frame, and are lowered into the melted tallow and raised again by machinery, a counter-weight being used to indicate when the wicks have taken up the required quantity.

Mould candles are made in cylindrical moulds of pewter, one end of which is smaller than the other to allow of the easy removal of the candles.

From ten to sixteen of these moulds are placed together in a wooden frame, so that their larger ends terminate in a kind of trough common to the whole; the wicks are inserted and kept firmly in their proper places in the centre of each cylinder by strong wires. The frame being then placed with the trough uppermost, the moulds are filled with melted tallow or other substance, and are placed in the air to cool, after which the wires by which the wicks are fixed are withdrawn, and the superfluous tallow is removed. The process is now carried on by means of machinery, of American invention, represented in our Plate, figs. 1 and 2 (the letters denote the same parts). *A A* is the iron frame of

the machine, with standards, *L L*, supporting a water jacket, *M*, through which the candle moulds run. The top of the jacket is somewhat sunk, so as to form a shallow tray (fig. 2). This is perforated at regular intervals to receive the moulds, which are simple pewter tubes open at both ends. The bottom of each mould is formed by a close-fitting inverted cone or "tip," with a hole in its centre for the wick to pass through. Each tip is fixed on the top of a hollow rod, *D*, which has its lower end fastened to the board, *N N*. This board, with the attached rods, is raised by the rack-work, *O*, when its corresponding cog-wheel is turned by the handle, *P*. The bottom of the machine contains bobbins of wick, *E*, which revolve on stout iron pins. Each mould has its own spool of wick.

At the top of the machine are two racks, *U U*, furnished with holes, *V V*, precisely opposite the moulds beneath, to receive the candles. These racks are hinged at the top. Fig. 3 shows one of them open; fig. 4 one closed. Each candle is pushed up into its respective orifice, and there secured by turning the handle, *C*, of an eccentric wedge, which runs the whole length of the rack and nips the two halves tightly together.

The moulds are heated and cooled by sending hot and cold water (or steam and cold water) alternately through the jacket, *M*. The inlet pipe is at the back of the machine, fig. 1, and the axle, *U*, of the tilting machine, fig. 2. *H* is the overflow pipe, and *G* the valve for running off the water.

The action of the machine can be seen by a glance at figs. 5 and 6. The wick is stretched between the bobbins, *E E*, and the candles, *B B*; in fig. 5 the hollow rod, *D*, with its conical tip, is in the act of ejecting the candle and unwinding the bobbin to supply a wick for the next tilting; in fig. 6 it has returned to its place, leaving the candle in the rack, and the wick stretched between the bobbin, *E*, and the candle, *B*. The workman should see that the cotton under the piston plate is slightly strained.

A different method is adopted for the manufacture of wax candles, the material of which shrinks too much in cooling for them to be made in moulds. The process adopted is as follows:—The wicks having been warmed, a set is suspended over a basin of melted wax, which is taken up by a large ladle and poured from time to time on the tops of the wicks, the melted wax running down and covering them throughout their entire length. This is repeated until a sufficient weight of wax has been gathered upon each. After the candles are sufficiently cooled they are rolled smooth and even by means of two smooth flat pieces of wood, which are kept wetted to prevent adhesion. Spermaceti candles are made from spermaceti mixed with a little bees' wax. Stearine candles are made from stearic acid, the chief fatty acid of tallow, palm-oil, &c., which is obtained from the raw material by means of a process discovered by the French chemists Chevreul and De Milly. Composite candles are made of a variety of materials, stearic acid from tallow or cocoa-nut oil being the chief ingredient. Price's patent candles, which were a great improvement on all before used, are made chiefly from palm oil. The introduction of paraffin oil for illuminating purposes has already greatly diminished the use of candles made from the materials named above. From the crude oil extracted from shale a beautiful white substance called paraffin is separated in the process of refining, and is formed into candles which can scarcely be distinguished from wax, and have become very popular, both from their handsome appearance and brilliant light.

Considerable ingenuity has been displayed in the making of suitable wicks for candles. The earliest material used for this purpose appears to have been the pith of a rush. In Anglo-Saxon times splinters of wood were used for this purpose. Cotton rovings were used for a long period, the plaited wick being introduced by Cambacière to obviate the necessity of snuffing. The action of the wick is merely mechanical, serving in the first instance, by the heat given

cut during its combustion, to fuse that portion of the tallow or wax to which it is more nearly applied, and then to take up through its fibres the fluid matter, which is thus prepared by minute division for decomposition and combustion. In order to insure the proper burning of the candle, the wick requires to bear a given relation to the thickness of the candle. The wick is given to consume away without snuffing by causing the end to fall outside the flame, and thus come in contact with the oxygen of the air. This is done by twisting the wick with one thread shorter than the rest, by coating one of the threads with bismuth, or by adding a mixture of borax, bismuth, flour, and charcoal, in the form of paste, to one side of the wick. Wicks of the two latter descriptions are termed *metallic wicks*. Candle wicks are now made by machinery.

CANDLEBERRY MYRTLE is the common name for the genus *MYRTICA*, and applied especially to *Myrica cerifera*, otherwise called Bayberry and Wax Myrtle. It is a native of North America from Lake Erie to Florida, and closely allied to our native sweet gale. It is a shrub, growing from 3 to 8 feet high, with fragrant lance shaped leaves, resinous-dotted on both sides. The catkins are solitary. On the female catkins there are four to nine fruits, consisting of a stone inclosed by black grains, which are themselves covered with white wax. The fruits remain on the shrub sometimes for two or three years. Not only the leaves, but the fruits and young shoots are fragrant with a balsamic odour.

One third in weight of the ripe fruits consists of wax; this is obtained by boiling the berries in water for some time and allowing it to cool, when the wax collects on the top. This is purified by remelting. It is of a greenish-grey colour, and of a consistence intermediate between bees wax and tallow. Mixed with tallow or used alone, the wax is made into candles, which burn with a white flame, though not so vivid as from tallow. An agreeable perfume is given off while burning. The wax is also made into hard soap, mixed with the lye of wood ashes, lime, and common salt.

CANDLEMAS, the popular name for the Feast of the Purification of the Virgin Mary, which is held on the 2nd February. In the Roman Catholic Church great importance is attached to this feast, processions in which lighted candles are carried by the people being held, and the candles required for ecclesiastical purposes throughout the year being consecrated on that day; hence the name. The use of candles on this feast is supposed to have an emblematical reference to the words of Simeon, in which he spoke of the child Jesus being "a light to Enlighten the Gentiles." The institution of this feast dates from the time of Pope Sergius, who instituted it in the place of the heathen festival of Februs, in which candles were offered and lighted, and the ceremony of a lustration of the people took place. In Scotland Candlemas forms one of the four term-days, the others being Whit Sunday, Lammas, and Martinmas.

CANDLENUTS are the kernels of the seeds of *Alouretia moluccana*, a tree belonging to the order EUPHORBIACEÆ. This tree grows to a height of 30 or 40 feet, and is commonly cultivated in the tropics for the sake of the nuts. Strung on a reed, the oily kernels serve for candles. The oil is bland, and is used for food, for burning, and as a drying oil for paint. Another candle tree is a species of *PARMENTIERA*.

CANDY, formerly the capital of the King of Candy's dominions, in Ceylon, situated about 65 miles direct distance E.N.E. from Colombo, in 7° 20' N. lat., and 80° 50' E. lon. A railway connecting the two towns, 74 miles in length, was opened in 1865, since which Candy has been much improved. Large works for a constant supply of pure water and for the health and cleanliness of the town, were also carried out. A fountain to commemorate the visit of the Prince of Wales was erected in 1877. The

city is also nearly surrounded, at the distance of 3 miles, by the river Mahaweli Ganga. The principal street is on the declivity of a hill, and is nearly 2 miles long. The houses are chiefly of one story high. The governor and most of the leading officials have residences—that of the former being the finest building in the island. There are some European barracks, an hospital on the banks of an artificial lake, several schools, and many Buddhist and Hindu temples. Candy was captured by the British in February, 1803, but they were compelled to evacuate it in the following June. The King of Candy was deposed in 1815 by his own subjects, and the British were invited to take possession of his territories.

CANDYTUFT. See *IBERIA*.

CANE. See *CALAMUS*.

CANE A or **KHANIA**, a fortified town and principal seaport of Crete, of which since 1810 it has been the capital, is situated on the northern coast of the island. Its harbour, which is formed by a mole 1200 feet long, with a lighthouse at the end, does not allow of the entrance of large vessels on account of the accumulation of sand. There are several mosques and churches, a synagogue, and several Venetian buildings and fortifications. It is the seat of a Greek bishop and of a pasha, as well as the residence of the various consuls. A considerable manufacture in leather and some shipbuilding are carried on; oil and soap are, however, the principal exports. In the environs, which are beautifully laid out, there is on the east a considerable village of Arabs, who act as boatmen and labourers. An earthquake occurred here in 1856. The ancient name of the city is *Cydonia*. Population, of whom about two thirds are native Greeks, 12,000.

CANELLA (*alba*) is a handsome evergreen tree, 30 or 40 feet in height, a native of the West Indies, Bahamas, and South Florida. The foliage is laurel-like; the flowers of a pale violet colour, are arranged in branched corymbs. The bark of the young branches is largely exported; it is an aromatic stimulant and slight tonic. The flowers have a most exquisitely sweet aromatic smell, and when in blossom the tree perfumes the whole neighbourhood. "The leaves have a strong clove-like smell. The berries when ripe are greedily sought after by the different varieties of pigeons which abound in our woods, and give to their flesh the peculiar flavour for which they are so prized" (Macfadyen's "Flora of Jamaica"). The genus belongs to the order *CANELLACEÆ*.

CANELLA CEE is an order of plants, natives of tropical America. They consist of aromatic trees, of which the best known is a species of *CANELLIA*, called in Jamaica the "wild cinnamon." The order belongs to the *POLYPETALÆ*, being placed near the *Cruciferae* in the cohort *Parietales*. There are four or five sepals, the same number of petals or none. The stamens are monadelphous, with the anthers adnate in a ring outside the tube. The embryo is rather large in fleshy albumen. The leaves are undivided, alternate, without stipules. There are only three genera, *Canella*, *Cinnamodendron*, and *Cinnamomum*.

CANES VENATICI (the Hunting-dogs), a constellation added by Hevelius to fill a gap in the star-map. It lies between the tail of the Great Bear and above Coma Berenice (Berenice's hair). It will be found figured in our Plate *CONSTELLATIONS* (N. Hemisphere), above the number XIII. In the myth which makes the Bear *Callisto* and *Bootes* Arctas, her son, pursuing her under her cruel metamorphosis, this constellation serves as the dogs for the chase. Within the limits of *Canes Venatici* are several very remarkable nebulae.

CANG, CANGUE, or **KEA**, an instrument of punishment used by the Chinese. It consists of a large square wooden collar, weighing from 30 to 60 lbs., which is fastened closely round the neck of the offender. The nature of the offence committed and the duration of the punishment

are each inscribed upon the collar in large characters, and the fastening is sealed by the mandarin who has passed sentence. The prisoner is first led through the streets of the town where the offence has been committed, and he is then left exposed in some public place during the day, being locked up in prison during the night. During the term of punishment, which may extend to fifteen days, the prisoner is dependent upon his friends or upon charity for his food, which must be placed in his mouth, as he is quite unable to use his hands.

CANICULAR DAYS or **DOG-DAYS** is a name given to the forty days of the year from 3rd July to 11th August. The name is derived from *Canicula*, the Dog-star, a name of the beautiful star better known as Sirius. It is the chief ornament of the constellation CANIS MAJOR, and is the brightest of all the fixed stars. When Sirius, in ancient times and southern latitudes, rose heliacally—i.e. just so long before the sun as to be visible in the morning twilight—the great summer heat had begun, and the ancients attributed this to the scorching influence of this Dog-star or Canicula. (At present Sirius rises heliacally at a different season, owing to the precession of the equinoxes, and in the course of centuries will rise heliacally at Christmas, passing through all the seasons backwards.) The Egyptians had the beginning of their year dependent on the heliacal rising of the Canicula, which coincided with the full flood of the Nile; and from the aspect of the star, its colour, &c., Heplæstion records, the future Nile-flow was prognosticated, and the fortunes of the year predicted. The heliacal rising of Sirius in any given year differs, of course, with the latitude.

CANIDÆ is a family of the great mammalian order CARNIVORA, and forms the section Cynoidea, being the connecting link between the other two sections into which that order is divided. In the structure of the teeth the Canidæ resemble the BEARS (URSIDÆ). The dental formula of the Dog, which may be taken as the type of the family, is:—

$$\begin{array}{cccc} \text{Incisors,} & 3-3 & \text{canines,} & 1-1 \\ & 3-3 & & 1-1 \\ & & \text{premolars,} & 1-1 \\ & & & 1-1 \\ \text{molars,} & 2 & 2 & \\ & 3 & 3 & 12. \end{array}$$

The last premolar in the upper jaw and the first molar in the lower are the large carnassial teeth. With the exception of the lower carnassial, the molars have lost the sharp cutting edges characteristic of the cat family, and have become tuberculated. The Canidæ belong to the digitigrade section of the Carnivora; that is, they walk on the tips of their toes. The fore feet are not nearly so much used as weapons of offence as in the FELIDÆ, and the claws are not retractile. The fore feet have five toes each, the hind feet only four. The tongue is soft, and not armed with horny papillæ. The cæcum is well developed, and of a spiral form.

In the genus *Canis* (Dog, Wolf, JACKAL), the pupil of the eye is round or oblique, and the tail is moderate. In the genus *Vulpes* (Fox), the pupil contracts in the form of a vertical slip, and the tail is long and bushy. The genus *Lycan* has four toes on all the feet; it contains the curious HUNTING DOG. The Canidæ are represented in the Plates devoted to the CARNIVORA by the jackal (*Canis aureus*), the fenecæ (*Canis zerda*), and the fox (*Vulpes vulgaris*).

CANIS MAJOR, the constellation of the Great Dog, is distinguished by the glittering Sirius, which forms the muzzle of the imaginary figure. At present the constellation is best seen in February and March. It is figured in our Plate CONSTELLATIONS, close to the ship Argo, over the numbers VI. and VII. There is little doubt but that the stars now forming the hinder quarters of the Dog, and the small constellation Columba (the Dove), once were part of Argo; the spectator of the wintry sky will readily trace

the swelling rounded outline of the ancient galley stern. The older constellations often overlapped in this way. *Canis Major* is one of the original star-groups of Ptolemy. In the sky it comes beneath Orion's feet, along with *Lepus* (the Hare), which it may be supposed to be pursuing across the sky. *Sirius* is in the continuation of the line drawn through the belt of Orion, and at the end of January is on the meridian at midnight.

CANIS MINOR (the Little Dog), a constellation situated above the Great Dog, and distinguished by a remarkable star of the first magnitude, Procyon. To find it, draw a line through Orion's belt and *Sirius*; a perpendicular to this line from *Sirius* upwards will pass through Procyon, which is too large a star to be mistaken. It is also nearly in the line joining *Sirius* and Pollux, about midway between them. This constellation is figured in our Plate close to Gemini, and between the numbers VII. and VIII., N. Hemisphere.

CANKER. This term is applied, perhaps not with strict propriety, to a very serious disease of the foot of the horse. The horn having been separated from the sensible portion of the foot, a fungous substance is produced instead of new and healthy horn. The treatment, however, is exceedingly simple. Every portion of horn that has begun to detach itself must be removed. Some superficial caustic must then be applied in sufficient quantity to repress the growth of the fungus, and to rouse the exposed surface to healthy action, but not to eat into and corrode the foot. The butter (protocliride) of antimony is the best agent for accomplishing these purposes; for, being speedily decomposed by the moisture of the part, it can only act as a superficial caustic. The fungus having been repressed, the friar's balsam may succeed as a mild stimulant to the secretion of good horn. No ointment should touch the cankered foot; but pledgets of soft and clean tow should be placed over the sore, and bound firmly upon it, making as equal a pressure on every part of it as can possibly be effected. The foot should be dressed at least once every day, and kept as dry as circumstances will allow.

Inflammation of the internal part of the ear of the dog will sometimes produce a fungous ulceration, to which also the term *canker* has been applied. A dog may be observed to be continually shaking his head, or scratching his ear, or carrying his head on one side. If the part is examined, some degree of redness or enlargement of the irregular projections on the inside of the ear will be seen. This will generally yield to a few washings with soap and warm water; but should actual ulceration have commenced, a diachm of the extract of lead should be added to half a pint of a decoction of the heads of white poppies, and this substituted for the soap and water. The inflammation beginning to subside, a scruple of alum should be added to this lotion, in order to dry up the ulcer; but nothing stronger than this should be applied, and even the alum should be cautiously added, in proportion as the dog is able to bear it. Purgings and alterative medicines will be useful auxiliaries.

If the case is obstinate, and the ear begins to be extensively ulcerated, and the ulcer spreads over the flap of the ear, a seton should be inserted in the poll precisely between the ears, and extended from ear to ear. All water-dogs are particularly liable to this species of canker.

There is another variety of canker belonging to the flap of the ear to which the hound and the pointer are especially subject. It is either the consequence of that which has been just described, or exists independently of it. A sore appears on the edge of the flap of the ear of a true cankerous nature, and corrodes the very cartilage. The treatment of this also is simple and effectual. The ears, or at least the diseased ear, must be confined by a cap of leather or strong calico, for while the dog can flap and beat his ear it is evident that the sore can never heal. This being contrived, a strong ointment of alum or white vitriol

(sulphate of zinc), or both combined, should be well rubbed on the sore morning and night. The simple alum ointment should first be tried.

CANNA is a genus of plants belonging to the order SCITAMINEÆ. There are thirty species, natives of tropical and subtropical America, of which one is found also in the warmer regions of both old and new worlds. They have smooth leaves, stems coloured at the base, and the roots tuberous and large. The rootstock of many of the species is used for making arrow-root. Nearly all the species contain starch in the rootstock, which renders them fit to be used as food after being cooked. The starch is separated by tearing the rootstock in pieces, and submitting it to the action of water. The water is then poured off, and the starch is afterwards allowed to subside. This starch is known as *tous les mois*, and is considered better suited for invalids than the ordinary arrow-root.

The flowers are showy, and the whole plant is ornamental, so that many species are cultivated. The sepals are free, the petals three, adherent at the base to the stamens. Only one of the five stamens is fertile; they are longer than the petals, and coloured like a corolla. There are two whorls—the outer of three, the inner of two stamens. Of the two in the inner whorl, one forms a kind of lip, the other bearing an anther on one side in contact (in the bud) with the front of the style, round which this stamode is folded, the upper part recurved, the base fused with the posterior surface of the style. The ovary has several ovules. The embryo is central and straight.

CAN'NABIS is the genus of plants that yields the substance called HEMP. *Cannabis sativa*, or common hemp, is a plant nearly allied botanically to the nettle, with which it even agrees in its general appearance. [See URUCACEÆ.] It possesses a tough kind of woody tissue, which is manufactured into linen and cordage, and contains a narcotic secretion of great energy. The inhabitants of many parts of the East avail themselves of this property to make an intoxicating drink. The plant owes its narcotic properties to a resin which is not formed except in warm countries; it exudes from the leaves, slender branches, and flowers.

This plant is mentioned in Chinese works 500 years B.C. The Sanskrit word is *banga*, whence the Hindu and Persian *bang*; *cannabis* is the Greek and Latin form, *cannab* the Arabian word. It occurs wild south of the Caspian Sea and in the south-western parts of Siberia, and is common everywhere in the gardens of the natives throughout Asia.

CAN'NE, an ancient town of Apulia, in Southern Italy, now only a village called Canne, in the province of Bari, 8 miles W.S.W. of Barletta. It is celebrated for the great victory gained over the Romans by Hannibal B.C. 216, the site of the battle being still known as the "Campo di Sargani."

CAN'NEL COAL contains an unusual amount of ash, associated with a large proportion of volatile ingredients. The name is derived from its burning with a bright and luminous flame resembling a candle (*canny*). It breaks with a flat conchoidal fracture, has little lustre, and is compact and even in texture, the specific gravity being about 1.25; the colour is black or brownish, and it does not soil the fingers. The Scotch variety, "parrot coal" (or "rattlers" of York-shire), decrepitates with a loud crackling noise when burning.

Cannel coal is very valuable for the production of mineral oil and gas, which it yields in large quantities of considerable purity, and eminently fitted for purposes of illumination. It occurs in many of the British coalfields, especially those of Scotland.

The origin of this variety of coal is considered to have differed from that of most others, as it partakes more of the nature of a sedimentary or derivative rock, in the

absence of vegetable structure even under the microscope, the presence of the teeth and scales of fish, and the large proportion of ash it contains; it is, therefore, supposed to have been produced by the decomposition and disintegration of floating organic matter, or by the accumulation of masses of carbonaceous matter similar to that resulting from the bursting of peat bogs.

CANNES, a seaport of France, and chief town of the department of Alpes Maritimes, is situated on the slope of a hill above the shore of the Mediterranean, on the line between Mentone and Marseilles. It has a large quay, but vessels cannot come close to the shore. The vicinity presents many beautiful sites, in which the orange and citron flourish; the climate is delicious, and makes the town a favourite winter resort of many English families. The old town is a place of great antiquity, and has an ancient castle and church built on a hill. The modern portion consists of many fine villas, built of stone. Along the sea front runs a beautiful promenade. The inhabitants distil essences, manufacture soap, olive oil, and perfumery, and export anchovies, fruit, and corn. Napoleon I. landed at Cannes after his flight from Elba on the 1st March, 1815. In the neighbourhood was a favourite residence of Lord Brougham, who died here, and was interred in the Protestant Cemetery. The island of St. Marguerite, which lies off the coast, is celebrated as the place of confinement of the Man with the Iron Mask, and from it Marshal Bazaine made his escape. The population in 1883 was 20,000.

CAN'NIBALISM, the practice of eating human flesh. The name is derived from that of the original inhabitants of the West Indian Islands, amongst whom the custom was said to prevail, who were called Caribs or Caniba, titles which were Latinized as Caribales or Canibales. The practice is one which dates from remote antiquity, and it still prevails in many parts of the world. In the *Odyssey* of Homer we have the story of the monster Polyphemus devouring the companions of Ulysses; and Herodotus, speaking of the Massagætæ (i. 216), declares they used to eat their aged parents.

In the middle ages the stories of cannibalism were wonderfully exaggerated. Thus during the Crusades the Christian warriors maintained that the Saracens ate men, women, and children, and were particularly fond of a Christian babe torn from the breast of its mother. The Saracens, on the other hand, accused the Christian invaders of eating human flesh as well as that of the abominable swine, and unhappily there seems to be some reason for this charge. In an old metrical account of the first crusade, entitled the "Song of Antioch," the irregular rabble who followed the Christian army are described as eating the bodies of the slain Saracens during a time of scarcity, the regular knights being represented as laughing at the event, and sending a present of wine to the feast. The old romance of Richard Cœur de Lion also represents that monarch as at one time eating part of the flesh of a Saracen, and though there is probably no foundation for the story, it shows that such a thing was then regarded as possible.

As a last resource in times of famine it has been resorted to in all countries and in all ages of the world. In the Old Testament, both in the Pentateuch (Lev. xxvi. 29; Deut. xxviii. 53-58) and in the books of the prophets (Ezek. v. 10), the people of Israel are warned that in the event of their disobedience they will be reduced to such an extremity, and in 2 Kings vii. a story of cannibalism is recorded. Similar incidents are narrated in connection with many famous sieges, and in some accounts of Napoleon's disastrous retreat from Moscow, at the commencement of the present century, a few of the starving French troops are said to have resorted to the practice.

Later instances of cannibalism being practised among civilized men might be found in connection with shipwrecks and disasters at sea; indeed it seemed at one time to be

almost a tradition among sailors that when threatened with starvation they should cast lots for one to be eaten.

These stories, however, all refer to the practice as being only resorted to under the pressure of extreme necessity, but there are several tribes of savages who are habitual cannibals. Thus Marco Polo, the Venetian, who resided in China and traversed the Indian seas in the thirteenth century, speaks of a people in Sumatra (the Battas), and of the fierce inhabitants of the group of islands called the Andamans, who were regular eaters of human flesh, devouring war captives, criminals, and slaves; and the rescues of modern travellers all tend to confirm the truth of the story. The New Zealanders, one of the finest of the primitive races in many respects, were until quite a recent period systematic eaters of their captives taken in war. There are at least two races in Central Africa among whom human flesh is an article of diet; and it is somewhat strange that, according to Dr. Livingstone, they are physically among the finest races on that continent. In the Fijian Islands the people, previous to the advent of the missionaries, were confirmed cannibals, the well-authenticated stories of their cruelties in the pursuit of this practice being of the most horrible description. The wonderful progress made by Christianity among them has abolished the habit.

CANNING, CHARLES JOHN, Viscount Canning, third and youngest son of George Canning, was born at Brompton, London, on the 11th of December, 1812. He was educated at Eton and Christ Church, Oxford, where he graduated B.A. in 1833. On a vacancy in the representation of Warwick in 1836, he was returned to Parliament as a supporter of the Opposition, headed at that time by Sir Robert Peel; but his stay in the lower house was of limited duration, inasmuch as in the following year the decease of his mother (who had been raised to the peerage on her husband's death in 1828) transferred him to the House of Lords. On the formation of Sir Robert Peel's administration in 1841, he became under-secretary of state for foreign affairs, which post he held till March, 1846, when he was appointed to the chief commissionership of woods and forests. In the following July, however, his party resigned office. On the formation of the Aberdeen ministry, in 1852, he undertook the office of postmaster-general, which he held until 1855. Towards the close of 1855 the Marquis of Dalhousie resigned the governor-generalship of India, and one of the last acts of Lord Aberdeen's government was to nominate Lord Canning as his successor. He reached the seat of government in February, 1856, and immediately set himself to work in earnest, pointing to the utmost of his ability the many social, political, educational, and military reforms, which had been commenced by his predecessor, and developing the internal resources of India by the extension of roads, railways, and telegraphic communication between the most important cities and military stations. In May of the following year, after smouldering for several weeks, the terrible Indian mutiny broke out in the neighbourhood of Meerut and Delhi. The suddenness of the outbreak was enough to have paralyzed an ordinary mind; but the danger was met by the government of Lord Canning in a way which reflected the highest credit on himself and his subordinates. Instead of issuing threatening proclamations, which it would have been as impolitic as it was impossible to carry into effect, Lord Canning, with characteristic readiness, intercepted the British troops that happened to be on their way to China, ordered such regiments as could be spared to be sent up from Madras and Bombay, and appointed one of the company's officers, Sir Patrick Grant, to the chief command. Disregarding the public excitement, and the popular outcry raised against him, he resisted the persuasion of those who would have urged him to adopt a bloodthirsty and vindictive course. He at once placed a curb upon the Indian press; and by

the appointment of a Mohammedan to a high position, showed the feeling of the government towards such natives as remained faithful in their allegiance. He refused to allow to Europeans the unrestrained use of firearms, being unwilling to stigmatize the natives as a body. And when the mutiny was already far advanced, he issued his celebrated proclamation with respect to Oude, by which he nominally confiscated to the British crown the entire proprietary rights of the land, intending to apply it to individual instances, with such modifications as he might find to be necessary. This despatch was much criticised at the time, and was severely and publicly censured by Lord Ellenborough, the president of the Board of Control, who in consequence was obliged to resign his post in the administration of Lord Derby. Throughout the whole crisis Lord Canning's conduct was marked by moderation and coolness; and on British supremacy being re-established, he was made the first "Viceroy of India," presented with the thanks of both houses of parliament, and raised to the rank of earl. In 1862, however, he was compelled by ill health to return to England, and died in London on the 17th June of that year.

CANNING, GEORGE, was born on the 11th of April, 1759, in London. His descent on the paternal side was from an ancient family. He was first sent to Hyde Abbey School, near Winchester, whence he was removed to Eton. In 1787 he was entered as a student of Christ Church, Oxford, where he gained some academical honours by his Latin poetry. It has generally been stated that it was by the advice of Sheridan that Canning, who had entered at Lincoln's Inn, gave up the study of the law and devoted himself to a political career. Canning accepted the proposals of the Tory party, and was brought into Parliament by Pitt in 1793.

In 1796 Canning became under-secretary of state, and at the general election in that year he was returned for the Treasury borough of Wendover, Buckinghamshire. In the autumn of 1797 he, in conjunction with some social and political friends, started a paper styled *The Anti-Jacobin*, the object of which was to attack the writers of the day who advocated the doctrines of the French Revolution. When the subject of the Irish Union was brought before Parliament, Canning repeatedly spoke at great length and with much effect in support of that measure. In 1799 he was appointed one of the commissioners for managing the affairs of India. In 1800 he married Miss Joan Scott, who brought him a fortune of £100,000. On the dissolution of Pitt's cabinet in 1801, Canning retired with the rest. On Pitt's return to office in 1804, Canning was named treasurer of the navy. Pitt died in January, 1806; in February the ministry was changed, and Canning was succeeded by Sheridan as treasurer of the navy. In April, 1807, Canning again accepted office, and was appointed secretary of state for foreign affairs. Of all the departments of government this was probably the one for which he was best qualified. On the 21st of September, 1809, he fought a duel with his colleague, Lord Castlereagh. The quarrel mainly arose out of the Walcheren expedition, and led to the resignation of the Duke of Portland and Canning, as well as of Lord Castlereagh. Canning had always been in favour of Catholic emancipation, and on the 21st of April, 1812, he eloquently supported Grattan, who moved that the Catholic claims should be referred to a committee of the whole house. The final success of that measure was largely owing to the untiring exertions and eloquence of Canning, who died a short time before it could be carried, and left that honour to others who had been through life its most violent opponents.

Parliament being dissolved in 1812, Canning was elected for Liverpool. In October, 1814, he was sent ambassador to Portugal. In 1816 he became president of the Board of Control. During the session of 1821 he supported the

Catholic claims with his usual warmth; and in the session of 1822 opposed parliamentary reform. In the course of the latter year he was named governor-general of India, and was at Liverpool to take leave of his friends and constituents, when Lord Castlereagh (then the Marquis of Londonderry, and at the head of foreign affairs) committed suicide on the 12th of August, 1822. On the 16th of September following, Canning, who had been entreated to give up his much more profitable Indian place, was again appointed secretary of state for foreign affairs, and almost immediately recognized the independence of the Spanish South American colonies, which had revolted from the mother country.

In 1827 the Earl of Liverpool, the premier, becoming incapacitated, Canning was named his successor. No sooner was this appointment announced, than the lord chancellor (Eldon), the Duke of Wellington, Earl Bathurst, the Earl of Westmoreland, Viscount Melville, Lord Bexley, Mr. (afterwards Sir Robert) Peel, with various members of the household, resigned in a manner which showed decided hostility to the new premier. Canning commenced a negotiation with the Whigs, which ended in the admission of several of them to office, and in the promise of support from others, at the head of whom were Mr. (afterwards Lord) Brougham, Mr. Tierney, and Sir Francis Burdett. The new premier repeated his determination to oppose parliamentary reform, and declared himself hostile to the repeal of the Test and Corporation Acts. On the 6th of July a treaty confining England, France, and Russia, for the settlement of the affairs of Greece, was signed at London. This was the last of Canning's public acts. About the middle of July Canning retired to the Duke of Devonshire's villa at Chiswick, where he died, 8th August, 1827. He was buried in Westminster Abbey, close to Pitt, and his widow was raised to the peerage.

CANNING, LORD STRATFORD DE REDCLIFFE. See REDCLIFFE.

CAN'NON. See ARTILLERY and GUN.

CAN'NON-BALL TREE. See COURBETIFA.

CANOE (from the Spanish *canoa*, a corruption of the Caribbean or West Indian native term for *boat*) is a peculiar sort of skiff or light boat, alike at both ends, worked by paddles. The canoes of the North American Indians are so light as to be easily carried beyond the waterfalls or shallows impeding the navigation; such tracks are called *portages*. Canoes are usually made of the hollowed trunk of a tree, or of the bark of the tree over a framework; or finally, of skins drawn over a wooden frame. They rarely allow more than one aboast, but their length is unlimited. Occasionally they carry a sail. The leverage of the paddle is gained by the one hand serving as fulcrum (or fulcrum) to the other, and then in its turn using the other hand as a pivot in like way the paddle having a blade at both ends. The power faces forwards in the canoe. In the great and populous of the Pacific the frail-looking canoes have outriggers, enabling them to live amongst the huge rollers with safety.

A modern development of the canoe has become a very favourite boat with tourists and holiday makers. It is covered with a light deck, pierced only by a hole admitting the helm of the owner; and it carries a small sail. In such craft rivers can be ascended to their source, and if land transport is necessary, the first cut or the nearest railway trunk is used. The interesting English and foreign canoe trips of Mr. Magellan on the *Rob Roy* brought this mode of travelling prominently into notice, and it speedily gained ground with the more enterprising of our younger travellers.

CAN'ON (On *Latin* *canon*). The several senses in which this word is used are all derivatives from its original sense of something straight. It has generally been employed in mathematics to mean a set of mathematical tables. It is

also used in music, and to express certain grammatical rules formed by critics. But it is more particularly appropriated in the sense of a *rule* in respect of things ecclesiastical.

Canon is also used for the *rule* of persons who are devoted to a life strictly religious. It is also applied to the *book* in which the rule was written; and since in such a book it was not unusual to enter the names of persons who had been benefactors to the community—whose names were recited from time to time with honour, and who were reputed to be holy persons or saints (*sancti*) the entry of such names formed what is meant by *canonization*, though in later times the term became confined to such persons as had their names enrolled in the great volume of which the pope was the sole guardian. It was also applied to persons who lived under a rule; as, the Augustinian canons, persons who adopted the rule of St. Augustine. The regular canons were persons who were confined to their own monasteries, where they practised their rule; the secular canons were persons living according to some prescribed Christian form and order, but who nevertheless visited the laity, and discharged the various offices of Christianity for their edification. As parish churches arose, the necessity for such visits from the canons who were attached to cathedral churches was diminished. But the institution was spared at the Reformation, and continues to the present day. These canons are sometimes called *prebendaries*, a name derived from their being endowed with land or tithe (though some are really not so), which endowment is called a *prebend*. The canons have stalls in the cathedral churches, which are generally called *prebendal stalls*. They form the chapter in the expression the dean and chapter, and are still nominally what they actually once were, the council of the bishop for the administration of the affairs of his diocese. For **CANON LAW** and **CANON** in music, see these articles.

From *canon* is formed *canonical*, which occurs in many ecclesiastical terms, as *canonical punishment*, *canonical obedience*, and *canonical scriptures*. The canonical scriptures are the usually received books of the Old and New Testament. See **BIBLE**; also **CANONICALS** and **CANONICAL HOURS**.

CANON. Canions (pr. canyons) are long narrow chasms, with steep lofty sides, which have been worn by the action of a river descending from a mountainous region on to table-lands or plateaux which have a strata of a porous or permeable nature of some depth, resting on a base of hard and impervious rock. The word is, however, often used in America for any gorge through which water flows.

The direction of the chasms depends on the hardness of the rocks with which the stream meets in its course; sometimes they run for many miles in an almost straight line, at others they take a zigzag or tortuous route. Cutting down through the upper strata until it reaches the hard rock, the river flows, bounded on either side by precipices, which often tower above it as high as from 5000 to 6000 feet, and whose sides disclose a curious tracing of the geology of the district. The fantastic shapes assumed by the worn-away rocks, the roaring of the stream, sometimes rushing through a channel less than 50 feet wide, as often happens even in the case of large rivers, and the depth and gloominess of the ravines, combine to produce a scene unrivalled in its grandeur and solemnity. The appearance of the level plains above is as though the crust of the earth had been cracked in every direction by some great volcanic disturbance.

The most magnificent illustration of this phenomenon occurs in the canions cut by the Colorado River in its course from the Rocky Mountains to the Gulf of California. This river takes its course through a formation of limestone and sedimentary rocks resting on granite. Canions are also found in the plain of Western Tibet; and the deep valleys and highlands in Africa, along the course of the Zambesi,

and in Abyssinia, are probably of the same nature. In Europe, the deep river-valleys of Spain exhibit canons on a small scale.

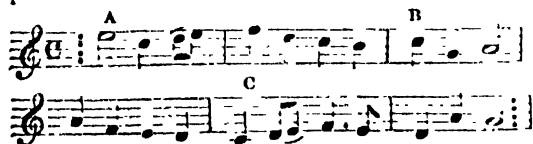
CAN'ON, in music. This most difficult species of composition is now undeservedly neglected. Yet a method of composition which gives us the well-known hymn-tune "Tallis' Canon," the grace "Non nobis, Domine," by Byrd, and the delightful quartet in the first act of Beethoven's "Fidelio"—to mention only pieces familiar to and admired by the least learned lover of music—is not fairly to be set aside as fit only for students' exercises.

Canon may be defined as a variety of IMITATION of a very strict kind, the specialty being that the whole piece shall form a circulating series. Thus in simple canon, a melody being given out by the first voice, is immediately afterwards sung by the second voice, the first voice passing to a second melody in counterpoint with the former. The second voice follows the same course as the first voice, at the specified distance; but when it attacks the second melody the first voice (having just concluded that) starts upon a third melody. At this juncture, if there are three voices in the piece, the third voice begins the original subject. Each voice, therefore, sings the entire series of three melodies, and the voices perpetually pursue each other, as it were, at the distance of the melody apart. If, on arriving at the end of the piece, a voice cannot, without discordant effect, recommence it, the piece does not *circulate*, and it is no canon, but a piece in imitation. If we represent the subject by A, the second melody in counterpoint to it by B, and the third by C, the example given above may be shown in a diagram, thus:—

1st voice, A	B	C	A	B	C	A	B	C	&c.
2nd voice, A		B	C	A	B	C	A	B	C
3rd voice,			A	B	C	A	B	C	&c.

It is evident that the portions between the bars will be repeated *ad infinitum*.

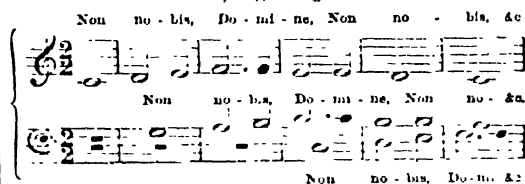
We may now particularize the chief varieties of this important branch of composition. What is given above is a **ROUND** if it is on a short subject and for voices; or if with comic words, it is a **CATCH**. The melody is completely finished before another voice takes it up. The imitations are at the unison or at the octave. The more voices there are the more difficult becomes the composition. Such canons are said to be *two in one*, *three in one*, &c., according to the number of voices; or *two in one at the octave*, *three in one at the unison*, &c., when the relative pitch is also particularized. Sometimes two separate and distinct series are continued; in fact, two canons are performed simultaneously: this would be called *four in two*, *six in two*, &c., according as there are four or six voices, &c. When there is no direction given as to the finish, the canon is *infinite*; but when (as in the case of the canon in the opera of "Fidelio" alluded to above) a coda is provided, into which the canon falls when the composer intends it to stop, the canon is *finite*. A finite canon is therefore made infinite by disregarding the coda, and *vice versa*. An *open* canon is one which is fully written out; a *close* canon is one where only one voice is written, with indications where the other voices enter. We subjoin an example of a close canon, *three in one at the unison*, distinguishing the melodies by the letters A, B, C, so that it serves to illustrate the first part of this article:—



When the first voice begins the melody B, the second voice starts at A; when the first voice begins the melody C,

and the second is at B, the third voice starts at A. The three voices then continue as long as they please, unless the composer indicates by a final chord that he desires the canon to be finite. The indications of entry of the successive voices are usually given by the signs § or *; and when the canon is left in the *close* expression, without any such indications, it becomes a musical riddle, and is said to be an *enigmatical* or *puzzle* canon. For the sake of cleanness we have used the word "voices," but this is not to imply that vocal music is specially alluded to; in this sense *voice* is quite synonymous with *part*; a canon for three *voices* or three *parts* means the same thing as for a construction goes. Into the practical methods for constructing canons space forbids us to enter; one thing alone seems necessary to observe, namely, that canons in the octave must be written in *double counterpoint* [see COUNTERPOINT], since the same melody is now above and now beneath its fellows by an octave distance.

The foregoing remarks apply to simple or *unrestricted* canon. *Restricted canon* is a much more difficult and effective production. Of this kind the best known examples are "Tallis' Canon" and Byrd's "Non nobis, Domine;" the latter is *three in one*, beginning thus:—



Here the second and third voices begin *upon the subject*, instead of after it; and in this instance, as indeed generally in this higher kind of canon, one or more of the voices is neither at the unison nor at the octave. In Byrd's canon it is seen that the second voice is at the fourth below, and the third voice is at the octave. The other remarks on unrestricted canon apply equally to restricted canon.

The other principal varieties of canon are as follow:—

Chorale canon is of two kinds, the first where the **CHORALE** is itself a canon, and is accompanied by one or more *free parts* (that is, parts or voices which are not part of the canon, but serve only to embellish or to fill up the harmony); and secondly, where the chorale is sung in unison against an accompanying canon.

Circle canon is so arranged as that the subject shall modulate at its close, usually to the dominant; so that by perpetually modulating the piece will, in the course of repetition, pass through every key in music.

Canon by inverse imitation. Here the second or accompanying melody is the first melody itself inverted; if the subject runs up a third, for example, the answer runs down the same interval.

Canon contrivans is a similar contrivance, but with *retrograde* imitation. The second or accompanying melody is here the first read backwards. It is evident that the two last are limited to the species *two in one at the unison* or *octave*; they are mere tricks of ingenuity, and are not nearly so difficult as at first sight they would appear to be.

Canons by diminution or augmentation are those in which the answer or second melody is the same as the subject or first melody, but in notes of half or of double value respectively. One voice repeats the subject twice therefore, while the other performs it once only.

CANON LAW, a collection of ecclesiastical constitutions for the regulation of the Church of Rome, consisting for the most part of ordinances of general and provincial councils, decrees promulgated by the popes with the sanction of the cardinals, and decretal epistles and bulls of the popes. The earliest canons are the apostolical canons, and, though the fact of their being the work of the apostles

does not admit of proof, there is no doubt that they belong to a very early period of ecclesiastical history.

These canons were enlarged by general councils. The canons of the four councils of Nice, Constantinople, Ephesus, and Chalcedon (which were held in the fourth and fifth centuries), received the sanction of Justinian, A.D. 529 ("Novel," 131, cap. 1). Collections of these canons were made at an early period. The most remarkable of these collections is the "Codex Canonum," which was compiled by Dionysius Exiguus, a Roman monk, A.D. 529. This body of constitutions, with the capitularies of Charlemagne and the decrees of the popes from Sixtus (A.D. 398) to Anastasius IV. (A.D. 1154), formed the principal part of the canon law until the twelfth century.

A collection of the decrees made by the popes and cardinals was begun by Ivo, bishop of Chartres, A.D. 1114, and perfected by Gratian, a Benedictine monk, in 1150, who first reduced these ecclesiastical constitutions into method. The work of Gratian is in three books, arranged in titles and chapters, and is commonly called "Decretum Gratiani." It comprises a series of canons and other ecclesiastical constitutions from the time of Constantine the Great, at the beginning of the fourth, to that of Pope Alexander III. at the end of the twelfth century. The Decretals, which were rescripts or letters of the popes in answer to questions of ecclesiastical matters submitted to them, and which had obtained the authority of law, were first published, A.D. 1231, in five books, by Raymond de Rufafort, chaplain to Pope Gregory IX. This work, which consists almost entirely of rescripts issued by the later popes, especially Alexander III., Innocent III., Honorius III., and Gregory IX. himself, forms the most essential part of the canon law. These Decretals comprise all the subjects which were then within the cognisance of the ecclesiastical courts, as the lives and conversation of the clergy, matrimony and divorces, inquisition of criminal matters, purgation, penance, excommunication, and the like. To these five books of Gregory, Boniface VIII. added a sixth (A.D. 1298), called "Sextus Decretalium" or the "Sextus," which is itself divided into five books, and forms a supplement to the first five books, of which it follows the arrangement. The "Sextus" consists of decrees promulgated after the pontificate of Gregory IX. The "Clementines" or "Constitutions" of Clement VI. were published by him in the council of Vienne (A.D. 1308), and were followed (A.D. 1317) by those of his successor, John XXII., called "Extravagantes Johannis." To these have since been added some decrees of later popes, arranged in five books after the manner of the "Sextus," and called "Extravagantes Communes." All these together, Gratian's "Decretum," the "Decretals" of Gregory IX., the "Sextus," the "Clementines," and the "Extravagants" of John XXII. and his successors, form the "Corpus Juris Canonici," or body of canon law.

The introduction of this new code gave rise to a new class of practitioners, commentators, and judges. The main object of the canon law was to establish the supremacy of ecclesiastical authority over the temporal power, or at least to assert the total independence of the clergy upon the laity. The positions, that the laws of laymen cannot bind the clergy to its populace, that the constitutions of princes in relation to ecclesiastical matters are of no authority if the subjects owe no allegiance to an excommunicated lord, and among the most prominent doctrines of Gratian's "Decretum" and the "Decretals." The encroachments of the church upon the temporal power were never encouraged in England. There was, indeed, a kind of national canon law, composed of *legatine* and *provincial* constitutions, adapted to the English Church. Of these the former were ecclesiastical laws enacted in national synods held under the Cardinals Otto and Othobon, legates from Pope Gregory IX. and Clement IV. in the reign of Henry III. The provincial constitutions were the decrees

of provincial synods held under divers archbishops of Canterbury, from Stephen Langton, in the reign of Henry III., to Henry Chichele, in the reign of Henry V., and adopted also by the province of York in the reign of Henry VI.

With respect to these canons, it was, at the Reformation, provided by statute 25 Henry VIII. c. 19 (afterwards repealed by 1 Mary, c. 8, but revived by 1 Eliz. c. 1), that they should be reviewed by the king and certain commissioners to be appointed under the Act, but that till such review should be made, all canons, constitutions, ordinances, and synodals provincial, being then already made and not repugnant to the law of the land or the king's prerogative, should still be in force. No review took place in Henry's time, but under Edward VI. a new code of ecclesiastical law was drawn up by a commission appointed by the crown under the statute 3 & 4 Edward VI. c. 11. The confirmation of this was prevented by the death of the king; and, though the project for a review of the old canons was renewed in the reign of Elizabeth, it was soon dropped, and has not been revived.

So much of the English canons made previously to the statute of Henry VIII. as are not repugnant to the common or statute law is still in force in this country. It has, however, been decided by the Court of King's Bench that the canons of the convocation of Canterbury in 1603 (which, though confirmed by King James I., never received the sanction of parliament), do not (except so far as they are declaratory of the ancient canon law) bind the laity of these realms. (Middletown v. Croft; Strange's "Reports," 1056.)

CANONICAL HOURS, the hours for service in the Roman Catholic Church, attributed to Pope Damasus (A.D. 366). David says, "Seven times a day do I praise thee" (Ps. cxix. 164); the church, therefore, instituted seven canonical hours, called matins, prime, tierce, sext, nones, vespers, and compline—respectively fixed for midnight (or soon after), for the first, third, sixth, ninth, and eleventh hours of the day, and for a late hour of the night, often near midnight, when compline *completed* the round. The compline is a corruption of *completorium*. The Breviary gives the services of the respective hours, and is sometimes called the "Book of Hours," especially in France.

CANONICALS (from Greek *canon*, a rule) is a term used to express special, sacred, or official articles of vestment; such are all priestly vestments, the legal and university robes, &c., though the latter are more usually denominated "academicals." Professor Brewer ("Act. of Prayer and Fable") gives an amusing list of curious lay canonicals. Among them are the *pouch* on the gown of a doctor of medicine, designed for carrying his drugs; and the *typt* on that of a barister, representing the wallet which held his briefs. The *coif* in the midst of the wig of the now obsolete serjeants at law was the symbol of the cap once covering the tunsure; and the *leading strings* of the Oxford undergraduate still decorate his freshman's gown.

CANONIZATION, in the Church of Rome, is the name given to the act of the pope, by which a deceased person is placed in the catalogue of saints. In the earliest times this honour was only conferred upon those who had died as martyrs for the faith; and the power of declaring such persons to be worthy of it was vested in the bishops. As the power of the papacy increased this right became the exclusive property of the popes, the first papal canonization being exercised by John XV. The ceremony gradually became invested with much solemnity and importance, and the steps necessary to obtain canonization were rendered costly and difficult. When the honour is sought on the behalf of any deceased person an inquiry, similar in many respects to that of a court of law, is instituted into the claims put forward. A period of at least 100 years must have elapsed since the decease, and evidence of some miracle wrought by the deceased person, or in connection with him or his body or tomb, is absolutely necessary. The part

of public prosecutor is sustained by an ecclesiastical official, commonly called the *Advocatus Diaboli*, or Devil's Advocate, whose duty it is to sift the evidence submitted, and to advance all the reasons he can find against the claims put forward. When the latter are finally accepted the ceremony is performed by the pope, and the mediation of the saint may be invoked by the faithful. The ceremony has hitherto been attended with considerable pomp, but the first ceremonies towards the latest canonization, that of Sir Thomas More and Bishop Fisher, in October, 1882, were very quiet, owing to the attitude of the papal court towards the Italian government.

CANO'PUS, the fine star in the constellation Argo (not far from Sirius in *Canis Major*), is the brightest star in the sky, Sirius alone excepted. The name is Egyptian, and described one of the deities of that land.

CANO'PUS or **CANO'BUS**, an ancient town of Lower Egypt, on the Mediterranean, 15 miles E. of Alexandria. There was a temple of Hercules here, and a very popular shrine of the god Serapis. The inhabitants were noted for their dissoluteness. They were chiefly employed in the manufacture of henna, the scarlet dye with which women dye their nails in the East. Though this town the ancient geographers drew the boundary line between Asia and Africa. Ruins alone now mark its site, for its prosperity declined as Alexandria rose into eminence. The Canopic mouth of the Nile derives its name from this town. The pilot of Menelaus, famed in Greek heroic tales, and who died of snake-bite in Egypt on the return from Troy, is said to have given his name to Canopus.

CANORUS is also the name of an Egyptian jar of a big bellied form, with a cover or top representing a human head or that of some animal. Bodies of sacred animals and the viscera of embalmed bodies are occasionally found in these vessels, which are sometimes called Canopic vases.

CAN'OPY, the coverings over niches, shrines, tombs, doors, and windows, used in Gothic architecture. They are usually elaborately carved, being intended not merely as a covering, but also as a mark of distinction. The various Gothic edifices in England present numerous examples of canopies. The word has a most curious derivation. It is really *canopy*, a Greek word for bed-hangings, necessary in southern climates for protection from mosquitoes and gnats (in Greek, *kanopya*).

CANO'SA (anciently *Canusium*), a town of Southern Italy, province of Bari, near the Ofanto, 15 miles S.W. of Barletta. The old city, said to have been founded by Diomed, or in a period antecedent to the records of Roman history, was in ancient times one of the most considerable cities in this part of Italy for extent, population, and magnificence. Its walls are said to have embraced a circuit of 16 miles; and various ruins still remain to attest its former grandeur. Among these are the remains of an aqueduct and of a vast amphitheatre, with tombs, columns, and triumphal arches. Great numbers of fictile vases of the best period have been found here, surpassing in size and beauty those found in the tombs of any other ancient city. The modern town occupies the site of the ancient citadel. The old cathedral, built in the sixth century, still remains. Its altars and pavements are rich in marbles; and the *verde antico* columns that support its roof are splendid even in their decay. Here is also the mausoleum of Bohemund, so celebrated in the "*Gerosalenne Liberata*." Tiberio Capece received the title of prince of Canosa in 1712.

Canusium was the place to which the wreck of the Roman army fled after the battle of Cannæ. At the apex of its prosperity under Trajan, it was reduced to its present condition by a series of disasters inflicted on it by the Goths, Saracens, and Normans.

CANOS'BA, not to be confused with the preceding, is a town near Reggio, Northern Italy, and is for ever memor-

able as the scene of the humiliation of the Emperor Henry IV. at the hands of Pope Hildebrand. See GREGORY VII.

CANO'VA, ANTO'NIO, was born 1st November, 1757, at Passagno, a village in the province of Treviso, in the Venetian territory. He lost his father (who was a worker in marble and also an architect of some merit) when he was still an infant, and was brought up under the care of his grandfather. Canova at an early age showed a taste for art, and when only nine years old executed two shrines in marble which are still in existence. At thirteen years of age he was received into the studio of one Bernardi, surnamed Torretto; and about two years afterwards, on Torretto's death, into that of his nephew, Giovanni Ferrari, who resided in Venice. About this time he commenced his first work of imagination, a group of Orpheus and Eurydice. Having now acquired some reputation, he was employed on some other works, chiefly busts; and he also modelled his group of *Dædalus* and *Icarus*—a work which may be said to have laid the foundation of his future fame. In 1779 the Cavaliere Zulian was sent ambassador from Venice to Rome, and the senator Falier gave the young sculptor a recommendation to that functionary. In October of that year he arrived at Rome, where his group of *Dædalus* and *Icarus* made a considerable impression. Canova returned to Venice, but soon after established himself in Rome, having obtained a pension from the Venetian senate of 300 ducats (about £60) a year for three years. His first work after his settlement there was a group of *Theseus* and the *Minotaur*. He was selected to execute the monument of Ganganeli (Pope Clement XIV.) for the church of the SS. Apostoli in Rome. This noble work of art was exhibited in 1787, and established at once Canova's claim to the highest rank in his profession. Before this was completed, Canova had commenced his model of Rezzonico's (Clement XIII.) monument. This work is in St. Peter's, and is a splendid effort of combined genius and skill. From this time Canova was constantly employed, and chiefly on subjects of imagination. In portrait he was considered less successful; though none who have seen his Popes Ganganeli, Rezzonico, and Braschi, will deny his power even in that branch of his art. He has the unique honour among modern sculptors of an entire pavilion in the Belvedere of the Vatican. His *Percussus* and two (classic) boxers are thus placed in direct competition with the *Laocœon* and the *Apollo Belvedere*—a cruel test, which nevertheless is borne with dignity.

Canova travelled when young over part of Germany, and went on three occasions to Paris. His last visit was for the purpose of selecting, for restitution, the works of art of which Rome had been plundered by the French. After performing this mission with tact and success, he proceeded to England, chiefly to see the *Elgin Marbles*. His reception in this country gave him much satisfaction. On his return to Rome, he received a patent of nobility, and was created Marquis of Ischia.

In the latter part of his life Canova was busily occupied in modelling decorations for a church which he had built in his native place; and it was at Venice, where he was staying to be near this object of his interest, that he died in October, 1822, of a disease from which he had long suffered, caused by the frequent use of carving tools. His simple and touching design for the tomb of the Archduchess Christina of Austria (Church of the Augustines, Vienna) his pupils reproduced for the master himself. It is one of the chief ornaments of the splendid "*Friari*" church at Venice.

Of most amiable and conciliating manners towards his brother artists and competitors for fame, Canova was also the liberal supporter and encourager of students of talent.

CANTA'BRI, a people of ancient Spain, who lived east of the Asturians, in the region now called Las Mon-

tañas de Santander. They were a brave, secluded, half wild race, who long resisted the Romans, and were only finally subdued, together with the Asturians, by Augustus, B.C. 25. They revolted again after some years, but were defeated and nearly exterminated by Agrippa, B.C. 19. They gave their name to the Oceanus Cantabrieus, now Bay of Biscay. The bravery and independent spirit of the Cantabii is often referred to by classical writers.

CANTABRIA, an ancient district included in *Hispania Tarraconensis*. Before the conquest of Spain by the Romans, this district covered Asturias, Santander, Biscay, and Guipuzcoa, but afterwards only Santander and a portion of Asturias. The inhabitants comprised five tribes, the Plantanri, the Varduli, the Autrigones, the Conisei or Concani, who, according to Horace (*Ode III. iv. 34*), fed on the blood of their horses—"letum equino sanguine Concanum"—and the Tusi. They were the bravest of all the Spanish tribes who opposed the Roman power, and some who retreated to the mountains were never entirely conquered. The Bisques are said to be descended from these. Horace, alluding to the difficulty the Romans had in subduing them, says, "Cantabum indoctum jugi ferre nostra" (*Ode II. vi. 21*).

CANTACUZENUS, JOHANNES, emperor from 1341 to 1355, was originally one of the great officials of the Eastern empire. He was so beloved by his master and friend, the Emperor Andronicus II., that he was often pressed by him to join him in the empire, a dangerous honour which he steadily declined. Andronicus, on his death, left Cantacuzenus guardian of his youthful son and heir, the Emperor John Palaeologus; but the latter soon rewarded the regent's faithful services by accusing him of treason, casting his relatives into prison, confiscating his fortune, and prescribing his poison. Cantacuzenus had no resource but the scaffold or a revolt. He chose the latter, and after a protracted struggle, in which he was uniformly victorious, he took Constantinople, and was acknowledged joint emperor by Palaeologus and his mother, Anne of Savoy (1347). In 1355, on a fresh quarrel breaking out, he abdicated and retired (voluntarily, according to his own account) into the convent of Mount Athos, where he ended in the odour of sanctity in 1411, having certainly exceeded a century of life, but by how much is not known. It was here that his valuable contribution to the history of the dark ages was written. (See *BYZANTINE HISTORIANS*, &c.) He also wrote theological treatises, chiefly against Mohammedanism.

CANTAL, a department in France formed out of Haute-Auvergne and named from the highest of its mountains, the Plomb du Cantal, is bounded N. by the departments of Corrèze and Puy-de-Dôme, E. by those of Haute-Loire and Lozère, S. by the department of Aveyron, and W. by those of Lot and Corrèze. It measures 68 miles from north-east to south-west, and 57 from south-east to north-west; the area is 2208 square miles; the population in 1882 was 236,190.

The department is almost entirely covered with the mountains of Auvergne, the principal chain of which crosses it from N.E. to S.W. In this chain and within a range of 7 miles in extent are the volcanic summits of Plomb-du-Cantal, Cône de Cère, Puy-Mary, and Puy-Volant, which rise to the respective heights of 6095, 5541, 5443, and 5229 feet above the sea. These peaks are of conical shape, bare, rugged, and from their steepness almost inaccessible. The whole range is of volcanic origin, and contains many craters distinguished by the local name *Puy*. In the neighbourhood of this central region are many ancient valleys filled up with lava, which has flowed at several unknown and long-distant epochs. The mountains are covered with snow during several months of the year. In the spring the lower heights abound with verdant pastures, intermixed with numerous wild flowers, especially violets, hyacinths,

lily of the valley, pinks, daisies, &c.; they also produce medicinal plants and orchil abundantly. The only human habitations met with in this wild region are the *burons*, or little huts, which serve as temporary dwellings for the cowherds, who drive their cattle hither in the fine season, and manufacture large quantities of butter and cheese.

At the lower extremities of the high plains and in the valleys which separate them are found the towns, villages, and cultivated lands of the department. Here also the flocks and herds come to pass the winter in vast buildings, the upper story of which is used as a store for corn and other farm produce. The valleys, which radiate in all directions from the mountain-knot of the Plomb-du-Cantal, are picturesque and beautiful in the extreme, abounding in woods, meadows, waters, and bold cascades, and strewed with neat villages, which are clustered round the parish church, or sheltered by a lofty precipice or some ancient castle. The same mountain-knot is the watershed of the basin of the Allier and the Loire on the N.E., and of the Dordogne and Garonne on the W. The Ruc, which receives the Sautoire, rises on the northern side of Plomb-du-Cantal, and flows N.W. into the Dordogne. The Cère rises in its south-western slopes, and, receiving the Jordanne a little below Aurillac, flows W. on its way to join the Dordogne, which forms for a few miles the boundary of the department on the N.W. The streams springing from the S. and S.E. of the central group flow into the Truyère, which rising in the mountains of Lozère, and flowing first eastward, then towards the N., enters the department of Cantal, crosses it to westward, then turns S.W., and falls into the Lot near Entraignes, in the department of Aveyron. The Alagnon rises on the eastern side, receives several small streams, and flowing N.N.E. falls into the Allier. In the south-west of the department rises the Côle, which flows S.W. into the Lot. Several of these rivers flow through very deep ravines, the precipitous sides of which show the different layers of lava and other strata through which the waters have worn their way. All of them abound in cascades, have great rapidity of descent, and are consequently not navigable.

To the south and west of the great mountain-range the department has a tolerably mild climate; to the north and east the climate is less genial; all the central and higher portion of the department has a rude climate and a long dry winter. The department is subject to terrible hurricanes; those that occur in the winter, called *ceies*, are especially fearful, as they sweep the snow before them, filling up the narrow valleys and burying the houses beneath the drift.

The department contains 1,440,585 acres. The arable portion consists generally of a very light and stony soil, and does not produce breadstuffs sufficient for the consumption of the department. Very little wheat is grown or used; the chief crops are—rye, buckwheat, barley, hemp, flax, and obnoxious plants. Chestnuts are abundant, and in some districts form the principal part of the food of the people; in other districts pease and lentils are used as food. The excellent mountain pastures form the main source of the wealth of the department. The number of horned cattle reared for exportation, and for the purpose of making butter and cheese, is immense. As much as 50,000 quintals of cheese are annually made. Horses are numerous; they are small in size, but hardy; mules are much used as beasts of burden. Sheep are very numerous, and in high repute for the quality of their wool. In mineral wealth the department is rich; copper, iron, lead, sulphur, alum, antimony, coal, limestone, slate, granite, &c., are found, but the only mine worked is one of coal. The number of mineral and hot springs is very great. The manufacturing industry of the department is of little importance; it is confined to the making of lace, copper vessels, coarse stuffs, glue, and leather. At the end

of autumn many of the population migrate to Paris and other parts of France, where they find employment as porters, water-carriers, tinkers, and handicraftsmen, returning home in the spring of the following year, or in some instances after an interval of several years, for the inhabitants are strongly attached to their poor, wild, but highly picturesque country. The mountainous nature of its surface, and the want of roads, canals, and navigable rivers, present great obstacles to the development of the trade of the department, which consists in the exportation of its cattle and agricultural products, and in the importation of corn, wine, oil, salt, metals, and cloth.

The department is divided into the following four arrondissements—Aurillac, Mauriac, Murat, and St. Flour. The capital of the department is Aurillac.

CANTA TA, an opera, generally in a lighter style and on a smaller scale than a true opera, simply sung, without the adjuncts of scenery, costume, or gesture; or an oratorio bearing a similar relation to the oratorio proper. Handel's masterpiece, "Acis and Galatea," is always sung as a cantata, though it has at least once been put upon the stage (by Macready, in 1842); and of modern examples the finest work of this style is Prof. Sterndale Bennett's "May Queen." The great number of choral societies which have arisen in the latter part of the present century have called the cantata into great prominence, and not a year passes without one or more meritorious works of this class being produced. The original meaning of the word was somewhat more restricted.

CANTEEN. A canteen is a place in barracks where a licensed person is allowed to sell provisions, liquors, coffee, &c., to non-commissioned officers and privates. The word canteen also means a small wooden vessel, capable of containing three pints, which is carried by each soldier on the march on foreign service or in the field. The use of them has been for some time general in the British army. Another kind of canteen is a square box fitted up with compartments, in which officers on foreign service pack a variety of articles.

CANTERBURY, a city, municipal and parliamentary borough, and the metropolitan see of England and Wales, stands on the river Stour, in the county of Kent, of which it is the capital. It is a city and county in itself, and a market-town, and is 56 miles E. by S. from London by the road, 71 by the South-eastern Railway, or by the London, Chatham, and Dover line 62 miles. Whitstable, its seaport, which is distant 7 miles, is connected with Canterbury by a branch line. By the Romans it was called *Durovernum*, by the Britons *Canr-Cant* (or the city of Kent), whence Cantuaria and Canterbury. It stood upon a ford of the Stour at which the roads from the forts of *Rutupie*, *Dulvæ*, and *Lemanæ* united in the great military road since known as Watling Street, and it is from this situation that the original name was probably derived, as the Celtic word *dur*, meaning "water," formed the first syllable. At the beginning of the Saxon Heptarchy it was the chief city of the kingdom of Kent, under the name of "Cant-wara-byrig," or "Kentish men's borough," and was the king's residence. Many Roman coins and other antiquities have been discovered in the city and neighbourhood.

Canterbury, in early times, suffered repeated ravages, particularly from the Danes, who, it is believed, threw up the mound called "The Dane John," for military purposes. At Canterbury was founded the first regular Christian establishment of Augustine, who, in the year 597, baptized Ethelbert, king of Kent. Augustine was the first archbishop, and died here in the year 604. Among the most celebrated of the archbishops was Thomas A'Becket, who was murdered before the altar by four of the attendants of King Henry II. in 1170. Charles I. was married here to Henrietta Marie, and Charles II., after his restoration, held court here for three days.

Canterbury is pleasantly situated in a fertile valley, surrounded by hills of moderate elevation. The river flows in separate channels, which are partly covered with houses and partly open. The city was formerly surrounded by a wall surmounted by twenty one towers, and had six principal gates. Much of the wall yet remains. The castle appears to have fallen into decay at a very early date, as no mention is made of it in connection therewith; but another castle was built, the donjon of which still exists, which is mentioned in Domesday Book. The chief public buildings are—the cathedral, numerous parish churches and several places of public worship for dissenters; guild hall, erected in 1139, and rebuilt in 1688; sessions house; corn and hop exchange; museum, which, besides a collection of curiosities, has a considerable library; assembly-room; theatre; music hall; Kent and Canterbury Hospital; dispensary; grammar and other schools; and the Clergy Orphan College, for sons of the clergy. The city has also cavalry and infantry barracks, and a large military infirmary. It still contains many old houses and remnants of antiquity, amongst which are—the house of Sir Thomas More, the Old Chequers Inn, where the pilgrims lodged, some old gabled houses with overhanging stories, and many ruins of ecclesiastical edifices; but nearly every year alterations are made which give it a more modern appearance. Formerly the drainage was very defective, but extensive irrigation works have been carried out which have thoroughly remedied this, and added much to the healthiness of the town. An improved water-supply has also been obtained. The principal out-door resort of the citizens is the Dane John, which is a pleasant and agreeable promenade.

The most interesting building in Canterbury is the cathedral—commenced by Lanfranc—which, having been nearly destroyed by fire in 1174, was rebuilt, and by successive archbishops enlarged and ornamented till it became the present magnificent structure, which exhibits specimens of every style of architecture, from the earliest Norman to the latest English. Its ancient celebrity is partly attributable to its association with the first establishment of Christianity in England, but more especially to the murder of Thomas A'Becket. The confirmation of his saintly character, which was supposed to have been shown by the victory of the English over the Scots at Alnwick, a few days after Henry II. had performed penance for the crime of his murder, completely established the reputation of his tomb for sanctity. Having been canonized, his bones were, in 1220, removed, with great pomp and expense, from the undercroft, where they had previously been deposited, to the Trinity Chapel, built for the purpose. The anniversary of the day on which they were removed was celebrated as a great festival down to the Reformation, and devotees, not only from every part of England, but of Europe, made pilgrimages to the shrine of the saint, to the enrichment both of the establishment and of the city generally. A supposed pilgrimage of this sort, such as was then usual, was made the medium of a lively description of the characters and customs of his day by the earliest of our great poets, Chaucer. From the merry and enjoyable way in which these pilgrimages were made, the word "canter" is derived, being the short form for a "Canterbury gallep," descriptive of an easy riding pace. Erasmus, who saw the shrine in undiminished splendour a short time previous to its annihilation, gives a vivid account of its wealth and magnificence. In 1536, however, all high festivals occurring between July and September (which included the chief festival at Canterbury) were forbidden, on the ground of their taking people from the necessary labours of harvest. But this was merely a prelude to more energetic measures; and, in the following year, A'Becket was thrust out of his place in the catalogue of saints, declared to have been a rebel, his bones being at the same time burned and scattered, and the treasury of his shrine appropriated to secular

purposes. The form of the cathedral is a double cross, with a beautiful tower, 244 feet high, rising from the intersection of the nave and western transept, and two massive towers at the west end, 156 feet high, one of which was rebuilt in 1832-40. The entire length of the cathedral, from east to west, is 514 feet within the walls; length of the choir, 180 feet; length of the eastern transept, 154 feet; of the western, 124 feet; width, including the aisles, 71 feet; height of the vaulted roof, 80 feet. Besides the Trinity Chapel, previously alluded to, there are numerous others decorating the interior of the building, as well as many beautiful monuments. Edward the Black Prince was buried in the choir. The crypt has been used since the time of Elizabeth as a French Protestant church. The library contains some rare MSS., and in the precincts are the residential houses of the clergy. The archbishops had at one time a palace here, but it became dilapidated, and has been superseded by Lambeth Palace. The cathedral also possesses a few specimens of twelfth century glass windows, unique in England. St. Augustine's monastery is in the eastern suburbs; it was formerly the palace of Ethelbert. After its conversion into a church and monastery, an abbey was built, and dedicated to St. Peter and St. Paul, subsequently changed by Dunstan to the title of St. Augustine. This abbey and its precincts occupied 16 acres, which were inclosed by a wall. It became a place of great magnificence, being endowed with 12,000 acres of land. Henry VIII. converted it into a palace for himself. Queen Mary granted it to Cardinal Pole; and Elizabeth kept court here. It long competed with the priory of Christchurch (which had the archbishop for its abbot) in importance and wealth, and as it contained the relics of many of the older English saints it had the advantage over its rival, until the murder of Thomas A'Becket in the cathedral church. The greater part of the monastery was restored, chiefly at the expense of J. Biersford Hope, Esq., M.P., and is now used as a missionary college. The fine gateway of St. Augustine, which still remains, formed the chief entrance. The ruins of the archiepiscopal palace, which was originally built by Archbishop Lanfranc, adjoin the borough of Stapleford, a suburb of the city. In 1875 a Roman Catholic church, dedicated to St. Thomas of Canterbury, was opened by Cardinal Manning. It is but a small and unpretending edifice. In ancient times the city had a reputation for silk manufactures, but they have given place to a superior kind of damask linen. Woisted is also made here. The trade of Canterbury, however, depends chiefly on the cultivation of hops, the plantations of which cover many hundreds of acres in the neighbourhood of the city. Canterbury gives the title of viscount to the Manners-Sutton family.

Canterbury formerly abounded with monasteries and numerous for monks and nuns of every order, chantries, hospitals, almshouses, and other religious and charitable institutions, founded by the piety of our forefathers. Amongst those which have survived to the present time are the Hospital of St. John, founded by Lanfranc in 1086, and now supporting a prior and eighteen brethren, who are appointed by the archbishop; Cogin's Hospital for Clergymen's Widows, founded in 1199; King's Bridge Hospital, established by Thomas A'Becket for educational purposes, and for the maintenance of poor persons; Maynard's and Cotton's Hospitals, Smith's and Hen's Almshouses, &c.; all of which in former times were under the management of trustees appointed by the lord chancellor. The free grammar-school, founded by Henry VIII. was endowed with twenty-four scholarships. This has been merged in a new scheme, called the middle class schools, which provide education for about 300 boys and girls at reduced school fees. As constituted under the Municipal Act, the city is divided into three wards, with a mayor, recorder, sheriff, six aldermen, and eighteen councillors. The municipal and par-

liamentary boroughs are identical. The population of Canterbury in 1881 was 21,071. Under the Redistribution of Seats Act of 1885 the town returns one member to the House of Commons.

CANTERBURY, a province occupying the middle portion of South Island, New Zealand, and extending, from S.W. to N.E., 210 miles, with a general breadth of 75 to 80 miles. Its western boundary is formed by the Southern Alps, many spurs from which descend far down into it, and there are lesser chains in the interior. The coastline is in most parts low and level, except where the high mountain group of Banks' Peninsula breaks the continuity through a space of 20 miles. From Canterbury Bight and Pegasus Bay, S. and N. of this peninsula, the plain sweeps round far inland, and forms the best lands of the province. With this plain the mountain valleys westward become confluent, from each of which a considerable river debouches. The chief of these are - the Waipara, Ashley, Waimakiri, Arari, and Wanganui. Several expand into long narrow lakes in part of their course, the largest being Tekapo, Pukaki, Tripp, and Coleridge. The capital of Canterbury is Christchurch, and the other principal settlements are - Lyttelton, which has a spacious harbour, but is exposed to easterly winds; Akaroa, the best port in the country; Kaupoi, and Timaru. This province contains the greatest quantity of level country, of reclaimed land, and of land under crop, in New Zealand. A vast coal-bed underlies a large part of the country, and is worked in some places. Gold and clay ironstone exist in various localities. Sown grasses for hay and pasture form the largest area; next are wheat, oats, and barley. About one-fourth of the province is inclosed land. The district was founded in 1850 by some leading members of the Church of England interested in the progress of New Zealand.

CANTHARIDÆ is a family of BEETLES belonging to the group TRACHYLIDÆ, of the section HETEROMERA. In this family the elytra are soft and flexible, and the antennæ are usually thread-like. The best known member of the family is the SPANISH FLY or Blister Beetle (*Cantharis vesicatoria*).

CANTHARIDIN ($C_8H_{12}O_2$) is the active principle of Spanish flies, so largely used in medicine for raising blisters. It is insoluble in water, but soluble in alcohol and ether, from which it crystallizes in four-sided prisms. It is a strongly irritant poison; 1 grain in 1 oz. of fluid produces strong vesication.

CANTHARIS OFFICINALIS (Geoffroy) - *Meloe resicatorius* (Linnaeus), *Lytta resicatoria* (Fabr.) - is extensively employed to produce blisters. The volatile principle which is exhaled by the living insect is so pungent as to cause great inconvenience to those who approach the trees where they alight. They are generally collected during the morning or evening, when somewhat torpid, by persons, whose faces and hands are protected by coverings, shaking or beating with poles the trees on which the insects are seated. The most common method of killing them is to expose them to the vapour of hot vinegar; they are then dried on hurdles, and put up for use. Turpentine is said to protect them from the attacks of certain small insects which prey upon particular parts of the dead insects. Though bearing the name of Spanish flies, the largest quantities are procured from Hungary, Russia, and Siberia. When good, they are of a shining yellowish-green colour; the odour is strong, viscid, disagreeable, resembling that of mice; taste acid, caustic, and urinous. By drying they lose a great portion of their weight; but age does not greatly lessen their active properties if kept in tightly stoppered bottles, so as to be preserved from air and damp.

The active principle of these insects is a white substance, which may be obtained in the form of small crystalline plates. To this the name CANTHARIDIN has been given. See the previous article.

CAN'TICLES, a word meaning songs, but which is given to the third of the Solomonian writings of the Old Testament, called in the Authorized Version the Song of Solomon. It was one of the books accepted by the ancient Jews as canonical, is included in the list of Josephus, and has ever been received as one of the inspired writings by the Christian Church. By the Jews it was ascribed to Solomon, of whom it is said (1 Kings iv. 32) that "his songs were a thousand and five;" and this opinion was universally accepted up to the close of the last century. By the later critics, however, this is disputed, and the date of its composition has, by some eminent scholars, both English and German, been placed as late as the time of Ezra and Nehemiah. On the other hand, the traditional belief in support of the title of the Canticles is still accepted by many scholars; while others who do not regard Solomon as being the author, yet place the composition of the book at a period shortly after the disruption of the kingdom under Rehoboam. That the book contains poetry of great beauty, and that its subject is love, are points that are universally accepted, but upon nearly every other point in connection with it the greatest differences of opinion have ever prevailed. As to its structure and design, it has been variously described by commentators as a continuous poem of a dramatic character, a pastoral eclogue, an epithalamium of a pastoral kind, an idyl, and a collection of independent love songs. A similar diversity exists with regard to the modes adopted for its interpretation. That it was to be regarded as an allegory was the belief, up to a recent period, both of Jews and Christians, but among both there has been but little unanimity as to the inner meaning concealed by the allegory. Among the former, the interpretation given in the Talmud is to the effect that the beloved Shelomoh (the peaceful) signifies God, and that under the title of the Shulamith (the same word, but with a feminine ending) is signified the people of Israel, and some of the Jewish commentators find concealed in the poem a complete history of the Jewish people up to the coming of the Messiah. In the Christian Church the book was from a very early period expounded as having reference to Christ and the church, and this interpretation was universally received until the time of Erasmus and Grotius, the latter of whom propounded what has been termed the typical theory, which obtained a very wide acceptance. According to this theory the book had two meanings, the first having reference to the marriage of Solomon with Pharaoh's daughter, and the second or inner meaning being of a spiritual character. At a still later period, a new school of critics arose, who laid aside both allegorical and typical modes of interpretation, and who regarded the book as being descriptive of true wedded love, innocent and happy, the composition being still ascribed to Solomon, and the object of his affection being either the daughter of Pharaoh or a woman of Israel. A closer investigation of the structure of the poem, however, showed that if the literal theory is accepted, Solomon is made to perform but a subordinate and inferior part, preference being given to a shepherd, husband, or lover. This led the way to a new interpretation, in which the book is regarded as expressing the feelings and temptations of a Jewish maiden who has been taken from her country home to the harem of Solomon at Jerusalem, but who remains faithful to her humble lover, and despising the temptations of wealth and royalty, is in the end reunited to him. Dr. Davidson considers it to have been written about the middle of the tenth century B.C., "in a spirit of protest against the court of Zion, and probably based on recollection of an actual occurrence." This theory, with various modifications, is that which is most generally accepted at the present time by biblical critics; but there are many who still adhere to the notion of an allegorical interpretation, resting their arguments chiefly on the ground of "Jewish

tradition and the analogy of Oriental poetry." In many places in the Old Testament the nuptial relation is taken as a symbol of the union between God and his people, and the same figure is employed in the New to illustrate the union between Christ and the church, while there are several Eastern poems known to European scholars in which religious fervour is symbolized by the figure of sexual love.

CANTILEVER or **CANTALIVER**, a projecting piece of wood, stone, or iron, which supports a cornice, balcony, &c. See **MODILLION**.

CANTIRE or **KINTYRE** (Gael, *cean*, head; and *tir*, land), a peninsula, forming the most southern part of Argyll, and stretching from the isthmus between E. and W. Tarbet lochs, in a S.S.W. direction, about 12 miles, with an average breadth of 6½, having the Firth of Clyde on the E. and the Atlantic on the W. The surface is mountainous, but few of the summits reach 1500 feet. The rocks are mica slate throughout, except near Campbeltown, where some sandstone troughs occur, containing imperfect coal-beds, and a few igneous outbursts of basaltic and porphyritic rocks. There are some fine valleys among the hills. At Campbeltown the continuity of the rocky ridge is broken by a hollow, which at a slight elevation (of about 40 feet) traverses through it from side to side. It is an old sea strait, by which the south part was constituted an island at a former period. The Mull (Gael, *moel*, or *muil*, round head) of Cantire is the high bluff cape terminating the peninsula, upon the sloping brow of which a lighthouse stands, the height of the fixed lights above the sea-level being 297 feet. There is access to the Tor-head in Antrim a distance of 13 miles. The population is chiefly resident at CAMPBELTOWN. Cantire was subdued by the Scots from Ireland in 210 A.D. In 146 they were driven from it, but returned under Fergus, the first Scottish king, in 503. It has since that time been successively occupied by the Northmen from Scandinavia, by the Macdonalds of the Isles, and by the Campbells. There are very many ancient relics of all kinds discovered in this peninsula.

CANTIUM, the ancient territory of the Cantii, in Britain, gives its name to the modern Kent; but it extended considerably further, including Londinium (London), &c. See **MAP OF BRITANNIA ANTIQVA**, prefixed to the present volume.

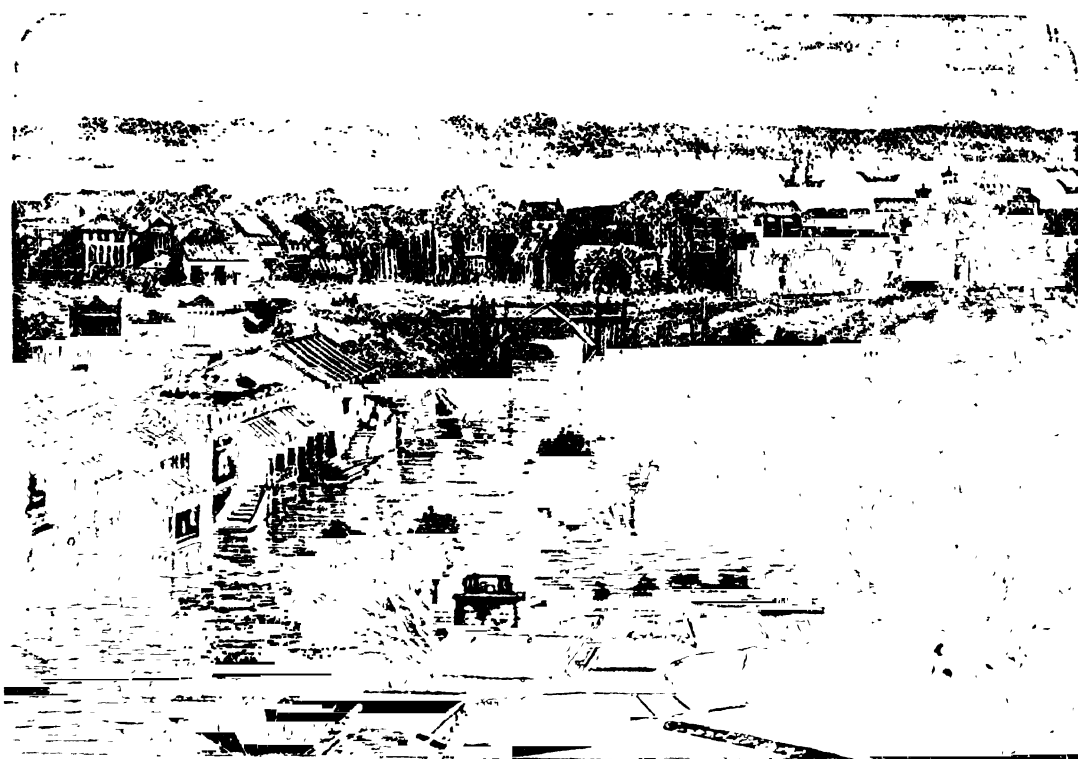
CAN'TO (Italian, *scng.* from Latin *cantus*), in poetry, one of the larger divisions of a long poem, such as those of Sir Walter Scott, &c. In music, the melody, and hence, in choral music, the upper part or treble; but if, as often happened formerly, the tenor held the melody, then that part was the canto. The term is now obsolescent, but is frequent on older copies of madrigals, &c.

CAN'TO FER'MO, the subject of a piece in counterpoint, against which subject the several accompanying melodies or counterpoints are written. The term arises from the invariable use of the early masters, such as Palestrina and his predecessors, who took as the groundwork of any piece of their church music, some one of the Gregorian tones or hymns consecrated by long service in the worship of God. But since these solemn tunes were sung in appropriately slow tempo, the requisite variety and brilliancy were obtained by the counterpoints. The same tone also served for many compositions, since the counterpoints could be infinitely varied. The subject, therefore, was the *canto fermo*, the "the firm or unvarying melody," in very truth. In reprints of the older masters, and in exercises in counterpoint, the *canto fermo* is marked C.F. Modern *canti fermi* are not limited, of course, to the Gregorian tones or such melodies; but for the purpose of a *canto fermo*—namely, to serve as a basis for ingenious and interesting counterpoints (or melodies to be added upon it)—some of their principal characteristics must be preserved, such as gravity, steadiness, slowness of movement, moderate compass, &c.

CAN TON, a city of China, capital of the province of Kuang-tong, of which Canton is a corruption. The real name is Kuang ch'w-foo. The city is situated on the eastern bank of the Chockang, or Pearl River, in 23° 7' N. lat., 113° 14' E. lon. The distance from the entrance of the river is 32 miles. At one time ships did not ascend higher than Wampoa (10 miles below Canton), whence the cargoes were transferred to native boats, but they now proceed to an anchorage opposite the British part of the city. The country to the north and east of the city is hilly and mountainous; to the south it is an alluvial flat, being the delta formed by the deposits from the main river. Smaller rivers and creeks are numerous, abundant with fish, and are covered with boats.

Canton is inclosed by a thick wall, of a square form, which on the south runs parallel to the river at the distance of about 100 yards, and on the north, where the city is built partly up the acclivities of the hills, takes an irreg-

ular course, and in some places is about 300 feet above the surface of the river. The entire circuit of the wall is about 7 miles. An interior wall, which runs from east to west, divides the city into two parts, of which the northern and largest part is called the Old City, and the southern part the New City. The walls are of brick, on a foundation of red sandstone, and vary in height from 20 to 30 feet. The exterior wall has twelve gates, and the interior four, which form the communications between the New City and the Old City. Most of the streets are short and irregularly laid out, varying in width from 6 to 16 feet, but in general they are about 8 feet wide, just allowing of the passage of two sedan chairs. They are everywhere flagged, more or less regularly, with large flat stones. The crowd that throngs them is exceedingly great. Bucks are generally used for the walls of houses, though a few of the poorer sort are constructed of mud. Stone and wood are sparingly used in building; stone is employed



Canton River and Ho nan Island.

about gateways, and wood for columns, beams, and rafters. The roofing consists invariably of thin tiles, which are laid on the rafters in rows alternately concave and convex, the latter overlapping the joint edges of the former and cemented over them with mortar. Window sashes are small and rarely supplied with glass. Paper, mica, and other semi-transparent substances are used in its place. The materials for building are procurable at moderate prices and in abundance. The wood, a variety of fir, is floated down the river in huge rafts, and at bucks are made in the neighbourhood.

The habitations in which about one-half of the population of Canton have their abodes stand close on the street, and have usually only a single entrance, which is closed by a bamboo screen suspended from the top of the door. Chinese houses of consequence open towards the south, but in the poorer sort this point, of course, is often dis-

regarded. The dwellings inhabited by the more wealthy part of the community are surrounded by a wall 12 or 14 feet high, which fronts the street, and completely screens the buildings within. The poorest persons live in the outlying parts of the suburbs, along the banks of the river and its creeks, and in the northern part of the Old City; their houses are mere mud hovels, low, narrow, dark, and without any division of apartments.

The shops are commonly quite open towards the street, that is, those appropriated to Chinese customers; for the few streets devoted to European trade are rather on a different plan, the shops being of a closer structure, and less exposed to external observation. The several streets are commonly devoted to distinct trades. By the side of each shop is suspended from on high a huge ornamental tablet of wood, varnished and gilded, on which are inscribed

the particular calling of the tenant and the goods in which he deals. The inhabitants of each division generally combine into a system of watch and ward for common protection, and during the night the streets are closed at each end by doors, which are guarded by the regular police.

Upwards of 120 different temples are enumerated in and adjacent to the city, and this does not include the whole number. The principal is the Buddhist temple on the island of Honan, in the river opposite Canton. Its buildings are numerous, and chiefly of brick; it covers, with its courts and gardens, 6 or 8 acres, which are surrounded by a lofty wall. The stillness which reigns within this barrier forms a striking contrast to the turmoil which prevails without. The pathway to the great central temple leads through two wide courtyards laid out with gravel walks, and planted with rows of trees; in the gateway separating these courts are two fierce-looking colossal figures, seated on huge pedestals of granite. The principal hall is about 80 feet square; its walls are hung with crimson tapestry and tablets, and its roof is ornamented with grotesque paintings and figures in relief; in the centre of the hall are three enormous, heavy, gilded figures representing the Past, Present, and Future, before which incense is continually burning. In various other halls there are shrines of inferior deities, and the remainder of the building is occupied chiefly by the dwellings and offices of the priests, of whom there are nearly 200. There are two other considerable Buddhist temples in the north-west part of the Old City, one of which, founded about A.D. 250, has about 200 inmates, and 3500 acres of landed property. In the Old City there is also a Mohammedan mosque, with a dome and minaret 160 feet in height; there are about 3000 Mohammedans in Canton. Without the walls, on the north side, there is a lofty pagoda five stories high.

The greatest risk to which the houses and shops of Canton are exposed is that of fires, which are frequent, the notion of fatalism, which prevails among the natives, rendering them singularly careless. The Chinese have very generally adopted the use of our engines, which they themselves manufacture sufficiently well to answer the purpose. Vagabonds and beggars are very numerous in Canton. The number of the native population of Canton has been often estimated; but so little authentic information has ever been obtained on the subject, that it still remains undecided. The calculation by which some have made it amount to 2,000,000 seems entitled to credit.

No inconsiderable part of the population lives upon the river, in the junks, barges, and small boats. The space opposite Canton and its suburbs resembles a floating city. By far the largest part consists of boats, which are generally not more than 10 or 12 feet long, about 6 broad, and so low that a person can scarcely stand up in them. Their covering consists of a bamboo or mat tilt, shaped like that of a waggon, which is very light, and serves tolerably as a defence against the weather. Whole families live in these boats, and are considered as a distinct part of the population, being under a separate regulation, and not allowed to intermarry with those on shore. Some of the floating houses are rather handsome residences; their hull is broad and large, and the building in the centre is surrounded by a spacious wooden terrace, and supports another on its roof. The British settlement at Canton is designated the Shamien Site, and is an artificial island, constructed in 1860-61, at an expense of 325,000 dollars, of which a fifth was defrayed by the French government, to whom a proportionate allotment of the area was made. The houses in this part of the city are chiefly built in modern European fashion, and the sanitary arrangements are well attended to.

The province in which Canton is situated is traversed by three magnificent streams, one of which is accessible for heavily laden boats for fully 700 miles, and for large

steamers for nearly 300 miles from the sea, and the other two for shorter distances. Two of the rivers join about 30 miles from Canton, and form a magnificent channel about a mile wide. After leaving the city this is fed by the other river, and gradually expands into an estuary, which at its mouth is 70 miles wide. This is known as the Boca-Tigris, from a Portuguese translation of the Chinese name for it—*Hu mun*, "Tiger's Mouth."

The facilities afforded to commerce by so extensive a water system, and its accessibility from the sea, made Canton at an early date the principal seaport of the empire. This distinction it retains despite the drawback it suffers from its distance from the rich producing districts of Central China. As early as the eighth century, trade with the ports of the Red Sea and the Indian Ocean was carried on here by Arabian vessels. Of European nations the Portuguese were the first to reach China, having visited Canton in 1517. Spanish, Dutch, and English adventurers soon followed, but the first English vessels did not reach it till 1637. Subsequently the prospect of a lucrative trade in silks, drugs, and tea led the East India Company to strive persistently to establish themselves here independently of the Portuguese, who sought, at their settlement at Macao, to monopolize all communication with China. By the end of the reign of Charles II. the company had planted several agencies along the coast, and about 1685 its factory was established at Canton. For a century and a half the trade with China was monopolized entirely by the East India Company; but in 1834 this monopoly ceased, and the commerce was thrown open to all classes. After the treaty of 1842, by which four additional ports were thrown open to foreign trade (see CHINA), our commercial relations with China rapidly increased, but the pre-eminence of Canton gradually declined. It is still, however, a wealthy, prosperous, and busy city; but instead of the foreign trade being concentrated in the hands of a few *hong*, or security merchants licensed by government, and the goods being brought direct from Europe, and sold in large parcels to dealers who were men of substance and wealth, the colony of Hong Kong has now become the market of Canton, where the dealers and brokers, large and small, purchase just what they require, and ship it for the coast places or Canton in junks; and as no reliable record is kept at the native customs stations of either imports or exports, it is quite impossible to arrive at even an approximate estimate of the quantities of values passing through Chinese hands.

Although in nearly the same latitude as Calcutta, the climate at Canton is generally remarkably healthy, though of course extremely hot during the summer, and at all times subject to great and sudden vicissitudes. In July and August the thermometer sometimes reaches 100° Fahr. in the shade, and during the winter it occasionally falls below the freezing point at night; the average of the year is about 72°. For many years Canton was the only port at which Europeans were permitted to trade. The imports consist chiefly of cotton goods, opium, and rice, and the exports of tea and silk.

According to native historians, Canton was founded by one of the last sovereigns of the Chow dynasty, who reigned about 2000 years ago. About the year 700 it became a regular mart for foreign trade, and the residence of an imperial commissioner of customs.

CAN'TON, in Switzerland, signifies a separate government or state, but in France only a subdivision of an arrondissement. The word comes from the Low Latin *canto*, a province; but whence this comes is at present doubtful.

CANTON, a corner of a shield in heraldry, comes from German *kante*, a corner or edge.

CANTONMENTS are the dwelling places occupied by an army during any suspension of active operations in the field: the term, though frequently applied to winter

quarters, particularly designates the more temporary shelter which an army may occasionally possess, and in which they hold themselves in readiness to take the field at a moment's warning.

CANTOR IS, the north side, or side of the *precentor* (cantoris) in a cathedral choir. The opposite side, the south side, is where the dean sits, and is hence called *decani*, or side of the dean. In chanting the psalms, and in other antiphonal work, the cantoris choir leads and the decani answers, verse by verse; hence in the older copies of secular music for double-choir, where these terms occur cantoris should read "first choir."

CANULEIAN LAW, the famous law of Rome, proposed by Cains Canuleius when tribune of the plebs, B.C. 445, creating a right of marriage for the plebs or commonalty with the patricians or aristocracy. The celebrated laws of the Twelve Tables, due to the Decemvirs, always regarded as the basis of Roman law, had specially prohibited such marriages; and this emendation of Canuleius was the first victory over the blemishes introduced under aristocratic pressure into what was, in the main, a fine body of legislation. His colleagues endeavored further to throw open the great offices of the state to plebeians, but this reform could not be carried till the time of the Licinian laws (367 B.C.); and even to carry the Canuleian law the "third secessio" had to take place, and the whole of the plebeians formally left Rome and encamped across the Tiber on the Janiculum Hill, the tribunes at their head, vowing not to return till the scourge of exile had been removed. The other claim was soon afterwards arranged by the creation of a new great office, that of Military Tribune, to which plebeians were eligible.

CANUTE or **CNUT** (955-1035) was the son of Sæegen, king of Denmark. On his father's death, in 1014, he was elected king by the victorious Danes in England, but it was not until after a long and severe struggle (ending in the battle of Assandun in Essex, now Aslington) that he succeeded in establishing himself as ruler in England. Edmund Ironside, the Saxon king, had fought bravely, and but for the treason of the "Alderman" (or Earl) Eadric would have probably been successful. But the defeat was so doubtful, and both sides were so exhausted, that the kings met in an island in the Severn, called Olney, and agreed to a partition of the kingdom. (The tradition of a personal combat between the kings on the island is not now considered to have any foundation.) Edmund was acknowledged titular head, and had Wessex, Essex, and East Anglia, with London, &c.; Canute had Northumberland and Mercia. A few months after, Edmund died, probably at the hands of the traitor Eadric. Canute sent to his brother, King Olaf of Sweden, Edmund's two sons, one of whom was afterwards so well known as Edward Atheling. It was only prudent to provide against revolt by thus exiling the older royal family. The young sons of Ethelred (brother of Edmund Ironside) were already with Emma their mother in Normandy. There is not a shadow of proof for those charges of cruelty in this and other instances which it was the fashion to bring against Canute, until Mr. Freeman and others began the present close study of our early history; and another important fact is that he married Emma, widow of Ethelred the Unready, who certainly would not have left her retreat in Normandy to marry a tyrant many years her junior. The severities necessary to put an end to the disorders of civil war were all at an end in less than two years; and Canute then began, by his noble qualities, to win on the affection of the people, till that remarkable love and trust grew up between them which is one of the brightest features of the Old English history. The great Earl Godwine (father of Harold) was one of his chosen counsels; and he even promoted Englishmen to great offices in Denmark, till the Danes protested loudly. When his position in England was assured, he carried his

army into Scotland and asserted his overlordship in that country, and in following years, in addition to succeeding his brother on the throne of Denmark, added by conquest the kingdom of Norway to his already extensive empire (1028). His rule was on the whole marked by great justice, wisdom, and moderation, and secured him the affection of his subjects and the respect of foreigners. The heterogeneous empire which, under his sway, was peaceful and prosperous, soon fell to pieces after his death. Towards the end of his life he showed great piety, and even made a pilgrimage to Rome. The beautiful little story of the rebuke which he gave to the flattery of his courtiers is well known, and is related in some of our oldest and best chronicles. Less known, but far more authentic and characteristic, is the touching long fatherly letter which Canute wrote to his English people from Rome, describing his journey, and his talk with the pope, and the favour he had gained for England; with humble vows of good and just rule in future, and commands to all his officers to deal justly, and "not to make the king's needs an excuse for wrong, for I have no need of money gathered by unrighteousness," &c. If space permitted, this letter, so honourable to the great Dane, should be quoted entire. It is no wonder that such a man, of foreign birth though he was, should be so loved and obeyed. He died in November, 1035, at Shaftesbury, and was buried at Winchester. It has been thought better to use the king's Latinized name, although he never bore it. In his lifetime he was called Cnut or Knud, and written of as Cnuto in Latin. He was christened Lambert by Ethelnoth, afterwards Archbishop of Canterbury. There is a St. Cnut, a later Danish king, whom Pope Paschal II. called *Canutus*, for euphony's sake, when he canonized him about the year 1100; and hence came the alteration in the name of Cnut the Great.

CANVAS (from *cannabis*, the hemp plant), a strong coarse cloth used for the sails of ships, tents, &c. As the name implies, canvas was originally made of hemp fibres only, but linen and mixed fibres are now also employed in its manufacture. The canvas required by oil-painters is prepared from ordinary canvas by a process called *priming*.

CANZONET, a song, short in comparison with the *aria*. Formerly the term was applied to vocal music in parts, but is now confined to songs for a single voice.

CAOUT CHIN ($C_{10}H_8$), a hydrocarbon obtained from the oils distilled from caoutchouc or india-rubber and gutta-percha. Caoutchin is a colourless liquid, of agreeable odour, recalling that of orange, and of aromatic taste. It boils at 175.5°C . (348°Fahr.); specific gravity, 0.842. It requires 2000 parts of water for solution, but is very soluble in ether and alcohol. It is inflammable, burning with a smoky flame.

CAOUT CHOUX. See INDIA-RUBBER.

CAP, a head covering, is derived from the Low Latin *capa*, a covering for the shoulders, still existing in our *cape*. About 1150 the head covering, until then the hood of the cape or mantle (a fashion still well shown in the monk's cowl and the lady's opera-cloak), began to be separated from the rest of the dress, and the *cape* or *cap* became a distinct garment. The first wearing of caps known is at Charles VII.'s entry into Rouen in 1419. At this period only royal and noble personages dare wear the velvet *mortier*; but the clergy obtaining permission later on to change their round *bonnet* for a sort of *mortier* in cloth, and the fashion of the time giving the latter a square shape, the well known *college-cap* came into use. The word *mortier*, still used for the legal head-dress of France, survives in England now only in the familiar nickname of the college-cap—"mortar-board."

The ancients went for the most part bareheaded, travellers, hunters, fishermen, and others much exposed to the sun, wearing, however, light hats or caps even in Greece; and in Rome, in addition to these, the "baser sort" habitually wore the *pileus* or the *petasus*. The patricians,

except in the amphitheatre if the sun was strong, or on a journey, slung the cap, drawing the toga over the head and neck if shelter were needed. The ceremony of freeing a slave ended with the master placing the cap, which thus formed one distinctive mark of the free plebeian, upon the slave's head. This was usually the pointed red *pileus*, and from this comes the well-known *cap of liberty*. When Caius Marius rose against the tyrants who oppressed the later Roman republic, he hoisted a red cap of liberty on a spear as his ensign, in token that the state was to be freed from its enslaved condition by his arms. The same symbol was most unworthily adopted by the conspirators against the great Cæsar when they marched through Rome after his murder. Since then the red cap has been the chosen emblem of revolutionaries.

The *cap of maintenance* is a part of the regalia used in the coronation, &c. Fur caps of maintenance are also allowed to many mayors, notably to the lord mayor of London, by one of whose personal attendants it is worn on all ceremonial occasions. Maintenance here means "defence," and the cap symbolizes the same idea, in a less degree, as the crown.

The family name of the Bourbon kings, *Capet*, comes from Lat. *capetus* ("the capped," or as said above, more correctly, "the cowed"), a surname given to the founder of the family, Hugh Capet, because, as abbot of St. Martin of Tours, he usually wore a clerical costume.

CAPACITY, in electricity, denotes the quantity of electricity which can be accumulated on a conductor. The electrostatic capacity of a conductor is gauged by the quantity of electricity which must be imparted to it in order to raise its potential from zero to unity; and the electrostatic unit of capacity is a sphere of one centimetre radius. The electrical capacity of spheres is proportional to their radii; thus a sphere of a metre radius has a capacity of 100, which means that it takes 100 times as much electricity to raise it to a given potential as to similarly raise the sphere of a centimetre radius. As a rough illustration from liquids, we might consider electrical conductors as vessels of different sizes, and potential as meaning relative level. It is manifest that if all the vessels are to be charged half full of liquid (which would represent raising them to the same potential), those which were larger would require proportionally more of the liquid so to charge them than those which were smaller. The larger vessels would then be said to have the larger capacity. The capacity of the whole earth has been calculated at 630,000,000 electrostatic units.

Another way of representing the capacity of a conductor is by regarding it as the quantity divided by the potential; and this definition holds good as well for electro-magnetic measurements as for electrostatic. The first are based on the force exerted between two magnet-poles, as in the electric light or electric telegraph—that is, current electricity; the second on the force exerted between two quantities of electricity, as in experiments with electrical machines—that is, frictional electricity.

The capacity of a conductor is increased by bringing near it a charge of an opposite kind, whence arises the great force of the LEYDEN JAR and similar electrical condensers. In measuring capacity, therefore, the conductor to be measured must be far removed from other conductors or electrical influences.

Specific inductive capacity was the name given by Faraday to the ratio between the capacities of an air-condenser and a condenser of equal size filled with the medium to be compared with air. Air is thus reckoned as the unit. In a rough way specific inductive capacity may be likened to "relative electric transparency." Thus electricity is induced across air—that is, a body charged with positive electricity will induce a charge of like amount, but of negative electricity, on a neighbouring conductor, if the

dielectric or medium between them be air; but its capacity being now increased by the presence of a conductor oppositely charged, as mentioned above, more electricity can be given to the first conductor, in its turn inducing more on the second, and thus once again increasing the electrical capacity of both conductors. Such an apparatus is called a "condenser," and if the dielectric were glass instead of air, the capacity of the condenser would be tripled as against one with air for a dielectric. Gordon ("Electr. and Mag.," London, 1880) gives the following specific inductive capacities of the dielectrics named:—

Air,	1.00	Ebonite,	2.28
Glass,	3.01	Shellac,	2.74

CAPE BRETON, an island situated north-east of Nova Scotia, and forming the south-eastern limit of the Gulf of St. Lawrence. It is separated from Nova Scotia by a strait about a mile wide and 20 miles long, called the Gut of Canso, which is remarkable for the irregularity of its tides. The island is almost cut in two by an inlet of the sea on the north-east, called Bras d'Or, which is separated from St. Peter's Bay, on the south-east, by an isthmus only 900 yards across. Along the coasts of this inland sea are many fine harbours, and everywhere the depth of water is great. The harbours on the west coast are Port Hood, at the north-west extremity of St. George's Bay, Mabon, and Margauie. The greatest length of the island from north to south is about 100 miles, and its greatest breadth 80. The area, exclusive of the Bras d'Or, is about 3120 square miles, about one-half of which is fit for cultivation. The land, especially in the north, stands pretty high; Cape Enfundé, on the north-east coast, is 1800 feet above the sea. There are three large fresh water lakes; one of them, Lake Ainslie, lies in the north-west peninsula; in the eastern peninsula, Loch Lomond and Miné Lake, which terminates in Miné Bay. The rivers are numerous, but their course is short, and none of them are navigable. The climate is not so rigorous nor so regular as that of the continent of America. Frost sets in about the middle of December and breaks up in the end of April, but during this time there are frequent intervals of milder weather. Spring is short, and vegetation exceedingly rapid. Crops are put down in May, fruits ripen in July, and the harvest is gathered in September. The population of the island in 1881 was 34,362, who are chiefly engaged in agriculture, the fisheries, and coal-mining, there being extensive fields of coal in the northern part of the island. The majority of the people are Roman Catholics; of the remainder the greater number are Presbyterians. The farm produce includes the common cereal grains, maize, and potatoes. The timber trees are pine, birch, oak, spruce, beech, ash, maple, and elm. Granite, limestone, coal, mica, and clay slate, plaster of Paris, and iron ore are found. There are several salt springs on the coasts of the Bras d'Or.

The island was first colonized about 1713 by the French, who named it from Bretagne, and built the fortifications of Louisbourg on the south-east coast, on a harbour of the same name. In 1758 the English took the island and demolished these fortifications, and the settlement has been since deserted. Sydney, a few miles from Sydney Harbour, on the north-east coast, is now the chief town, and has telegraphic connection with the American continent and Europe. The island of Cape Breton forms three counties, and is included in the government of Nova Scotia. To the north of Cape Breton is the little island of St. Paul, to the north-west is the Magdalen group, and to the south Aylesbury Island and Isle Madame. On this last is the town of Arichat.

CAPE CLEAR, the most southern point of Ireland, on an island of the same name. The headland is 400 feet high; and the island, which is about 3 miles long

by 1 mile broad, with an area of 1506 acres, is girt by high rocky cliffs, except where a few coves afford shelter. On the south-east side is a lighthouse, of which the light is at an elevation of 455 feet.

CAPE COAST CASTLE, a town and fort of West Africa, formerly the capital of the British settlements on the Gold Coast. The fort stands on a projecting rock of granite, and shows in fine relief against dark woods, reaching to a range of hills in the background. The town has a population of about 10,000 blacks and a few dozen Europeans, and consists of straggling rows of mud huts, with clumps of palm-trees and tamarinds, and a few good stone houses. The exports are palm oil, gold dust, ivory, maize, and tortoise shells; the imports are chiefly from the United Kingdom. The climate is unhealthy; mean temperature, 78° Fahr.; highest day temperature, 87° Fahr.; lowest night, 68° Fahr. The earliest settlement was by the Portuguese in 1610. It has been in the possession of the English since 1664. In consequence of its unhealthiness, the capital was removed to Accra in 1874.

CAPE COLONY, an extensive country occupying the most southern portion of the African continent. Until within recent years the Orange River formed the northern boundary, the Atlantic and Indian Oceans inclosing it on the west, south, and east. Within these limits the "Cape of Good Hope," as the country was formerly designated, had an area of 213,703 square miles, and a population of 1,103,200. The addition of the Diamond Fields of Griqualand West, with 16,670 square miles and 45,300 inhabitants, and of the thinly peopled tracts of Namaqua and Damaia Lands, with 175,000 square miles and a population of 14,000, raised the total area within control of the Cape government to 370,333 square miles, and the population to 1,288,500. The extreme breadth of the colony from north to south is about 500 miles, and its length from east to west about 800.

Physical Features.—The surface of the country generally is high. From the sea-board to the interior it rises step by step in a series of well defined terraces, of which the supporting walls are nearly parallel chains of rugged mountains. The plain next the sea is covered with a deep and fertile soil, watered by numerous rivulets, well clothed with grass, and with a beautiful variety of trees and shrubs. Rivers here are frequent; and from its vicinity to the sea it enjoys a more mild and equable temperature than the interior and remoter parts of the colony. These outer slopes are the most habitable parts of the country, and are occupied by villages, corn farms, vineyards, orchards, and tobacco plantations. Of the second to trace much the same may be said, but in lesser degree. It contains a considerable proportion of well-watered and fertile lands, but interspersed with large tracts of arid desert, called *Karoo*. The third plateau, called the Great Karroo, is a vast undulating plain 3000 feet above sea-level, 300 miles long by about 70 wide, north to south. Throughout this tract farms are few for water is scarce, and the water-channels which furrow its surface are dry excepting after thunderstorms, or but show only a few blackish pools. The land here is treeless; in some parts stunted bushes are thinly scattered, and at most times of the year the prospect is arid and dreary. In the cooler season, however, after heavy rains, a marvellous change takes place in the aspect of the Karroo. As if by enchantment, the whole plain is covered with a lovely green vegetation, with flowers of every hue. Countless flocks and herds, leaving the snowy mountains, descend into the plain, and find a plentiful and wholesome supply of food; while troops of the tall ostrich and wandering antelope share the repast and enliven the scene. The glorious prospect, however, is of but brief duration. In little more than a month the days begin to lengthen, the revived power of the mid-day sun checks once more the lately revived powers of vegetation. A few succulent

plants still furnish food for the herds and flocks, but every day the Karroo grows more and more solitary; by the end of September it is wholly deserted, almost all traces of verdure have vanished, and the hardened clay bursts into a thousand cracks under the intense power of the African sun.

The limits of the terraces are defined by parallel chains of mountains, rising to a highest and central range, which divides the drainage of the coastal streams from that of the inner tributaries of the Orange River in the north. This central range follows a curve almost identical with that of the coast, at a general distance of about 100 miles from the ocean; from the borders of Natal westward it is known in different portions as the Drakenberg, the Stormberg, Zuurberg, Sneeuwberg, Winterberg, Nieuwveld, and Roozeveld. In height its summits average 6000 feet, the highest points being Cathkin Peak, 10,300 feet, in the north-east corner of the colony, and Compassberg, in the Sneeuwberg, 8300 feet. The Great Karroo is immediately south of this range. Northward of the mountains the inner country slopes gradually to the Orange River, central Bushmanland being a plateau of from 3000 to 4000 feet above the sea. At a distance the mountains possess neither the sublime nor the beautiful, presenting generally a bold escarpment of flat-topped hills or table-mountains—the prevailing characteristic of the colony. The approach to their bases, however, and the *kloofs* by which they are intersected, are often very grand. The kloofs are deeply cut gorges, through which the periodical torrents escape to the sea. From them the naked rock of the hills sometimes rises perpendicularly, like a wall of masonry, to the height of 3000, 4000, and even 5000 feet. At other times the kloofs merge more gradually downwards, and the slopes are covered with abundant vegetation, in all the luxuriance of tropical growth and profusion. The south-western peninsula of the colony terminates in the famous CAPE OF GOOD HOPE.

In general the streams of Cape Colony resemble those of Australia in about the same latitude, or of Algeria at the opposite extremity of the continent; they become furious torrents after rain, but dwindle down almost to dryness at other seasons. Not one of them is of any considerable value for navigation. The largest, the Orange River, is a finer river above—immediately after the confluence of its upper tributaries, the Vaal and the Nu-Garison, which receive more constant supplies from the Drakenberg range—than it is lower down in its westward course to the Atlantic. But it is obstructed by rapids and falls, and its mouth is blocked up by a sandbank, so that it is of no value as a commercial highway. All along the north of the colony its channel is hemmed in by precipitous walls of rock, between which it descends in formidable cataracts. The drains which it receives from the Cape Colony are only filled with an evanescent supply, after a heavy thunder-shower may have fallen on the thirsty plains through which they pass. Of these the channel named the Hartbeeste is the longest.

Among the rivers which flow outward directly to the Atlantic, the Olifants or Elephants River of the west is the most important; in times of flood it overflows its banks like the Nile, depositing on these a rich sediment of mud which it has carried down from the Karroo, and over these inundated tracts heavy grain crops are grown. The Brede, the most westerly of the streams which flow due south, affords a very short navigable reach; the Gauritz and Gamtoos further east are at times rapid and dangerous torrents; and the Great Fish River, in the south-east, is also nearly a periodical stream, seldom flowing at all in winter, but rising as much as 30 feet in a few hours after summer thunder-showers. Round towards the eastern slope to the Indian Ocean the streams have a more constant flow, and become serviceable for irrigation and motive power. It may be said with truth, that water enough falls in ordinary

years to fertilize the whole of the colony; but it will not remain upon the surface of the bare, treeless land, and rushes back to the ocean in destructive torrents.

Climate.—The Cape Colony is not a hot country. On the open plains, towards the north especially, the sun is very powerful; but in the more habitable parts, the greatest heat of summer does not exceed that of similar days in the warmer parts of Europe, and in winter the thermometer falls below the freezing-point. A clear buoyant dry atmosphere is characteristic, and the seasons are distinguished as in Europe, though of course at opposite times—January falling in mid-summer, July in mid-winter. Round the coast-lands of the south and east, the amount of rainfall is about the same as the average in England, and the amount increases northward towards Natal; but in the interior and towards the west the quantity gradually decreases, till, on the plains which slope to the Orange River, the yearly fall does not exceed 9 inches altogether, and on the coast-land about the mouth of the Orange River rain is almost unknown. The distribution of the rainfall on the two sides of the colony, however, is remarkably contrasted in season. Over the south-western maritime region the rain is brought by the westerly winds which prevail in *winter* (April to October); the easterly sea-board, on the contrary, has its rains in the *summer* months (September to April). In the inland district summer thunderstorms are at times fearfully grand, and are accompanied by short heavy downpours. Snow lies for three or four months on the highest inland ranges. The salubrious and healthy character of the climate, as a whole, is admitted by the fact that the colony is growing increasingly popular as a resort for persons of delicate constitution.

Products.—In the natural flora of the Cape Colony the heaths have a world wide fame, as well as the bulbous plants and orchids which cover the ground in September and October with a sheet of gaudy blossom. Not a few plants of cactus like form are remarkable for their singular appearance. Thorns and prickles are also characteristic of many South African plants, and form a natural provision for dispersing the seed-vessels; some trees, such as the "dorn-boom," have spikes which have been compared to ox horns.

Wheat is one of the chief cultivated products, and it is grown in many districts, along with maize, oats, kafir-corn, and barley. The grapes of Constantia, on the peninsula of the Cape of Good Hope, are said to be the finest in the world, and here and in other parts of the Cape the cultivation of the vine has become an important source of wealth.

Though the elephant, rhinoceros, giraffe, lion, and leopard were common in the Cape Colony at the time of its earliest settlement, these larger animals have, with few exceptions, been driven far north into the interior beyond the frontier; but herds of antelopes, quaggas, and springboks still migrate south of the Orange River, and the hyenas and jackals keep their place. Since the migration of the larger wild animals, sheep and goats have multiplied in an extraordinary degree, so that in 1883 there were about 12,000,000 sheep in the colony, and their wool, which they yield in immense quantity, has become the staple export. Draught oxen, dragging the great canvas covered waggons, are still the chief means of conveyance in the colony, wherever railways have not been constructed. A newer and remarkable industry of the colony is that of ostrich-farming, the birds being fenced in and stabled like sheep or horses, to be plucked of their valuable feathers when these come to maturity; their eggs are also hatched in artificial nests warmed by hot water. See OSTRICH.

The only important mineral district of the colony as yet is that of Little Namaqualand in the north-west, near the lower Orange River, where the copper mine of Orkiep is one of the richest in the world, and is sunk so deep that the miners take twenty minutes to ascend from the bottom to the open air. The diamond-fields, which have proved a

most prolific source of wealth to Cape Colony, lie beyond the border of the colony proper, and will be described under GRUQUALAND WEST.

People.—The colony is as yet but sparsely peopled, there being a square mile of territory to each four or five individuals. The Europeans are now the most numerous section of the white population, and are mainly British and Dutch; part are also German and French (the descendants of Huguenot immigrants), and there are a few Portuguese. The Dutch, or the descendants of the earlier colonists, are still more numerous in the western district; the English prevail in numbers in the east. The former retain their language, but English has been the official language since 1822. The census returns, under the heading of religion, show that the Dutch constitute by far the majority in the colony. Upwards of 143,000 white persons were returned as belonging to the Dutch Reformed Church (the descendants with 26,500 Episcopalians, and 16,000 Presbyterians, Wesleyans, Independents, and Baptists all combined. Lutherans, chiefly Germans, numbered 6000; and Roman Catholics, mostly Irish, about 8500. From this the Dutch would appear to outnumber all other whites by nearly three to one. Throughout the Cape to a great extent even in the western or Dutch provinces) the population of the towns and large villages is mainly English; the banks are sustained by English capital, the stores and hotels are owned and managed by Englishmen. On the other hand, the English farmer is comparatively rare, and is only found in a few districts, while Dutchmen are spread all over the country from Table Mountain to the Limpopo, chiefly as owners of flocks and herds; and many thrifty Germans also make a comfortable living by cultivating small farms. As regards the style of farming in the several provinces, although the eastern are much better watered by nature than the western, in making dams and simple works of irrigation the Dutch farmers have done far more than the English. Moreover, the eastern have nothing to show in comparison with the grand old farmhouses, shaded with magnificent trees, and surrounded with well-kept orchards and vineyards, such as abound in the western. These, indeed, are the residences of wealthy Dutch families who have been in the colony and have owned the same property for several generations; but even in the remote districts of the parched Karoo the Boer improves his land and his house as his means improve, and makes the best of a country where British immigrants are not willing to settle. Many of the Englishmen who go out to the Cape are in a hurry to make money and leave the country as soon as possible. They have not the patience to labour, like the German cultivator, for small and certain returns; nor will they settle, like the Dutch Boer, in the remote pastoral wilderness, where few comforts and no luxuries can be enjoyed. The slow plodding farmer, however, who substitutes cattle and wool-bearing sheep for springboks and wild beasts, is a most useful citizen at the Cape; and it may truly be said that it is only the hardy frugal inhabitants of the country, new and rough as it is, who render possible the existence of any urban population.

There are now very few pure Hottentots within the limits of the colony, though these were the only inhabitants of all its central and western regions at the time of its discovery. Those who still live south of the Orange River are of a pale yellow-brown colour, generally below the average size, light hearted, and indolent.

The Kafirs form by far the largest share of the population, especially in the eastern districts. They are altogether inferior from the Hottentots; tall, dark brown in colour, active, and well made, inclined to a pastoral life and to warfare, but not to agriculture. Many thousands of them within the colony can no longer be called savages, having been brought under the influence of European civilization, wear clothes, and understand English or Dutch. In the eastern and

most recently annexed portions of South Africa a large extent of land is set aside as "reserves" or "locations" for natives only. Here white men are not permitted to acquire land, and the Kafirs live in perfect liberty, following their ancient customs as to dress, food, cultivation, &c., owning many cattle, and bearing no burdens, except the payment of a tax of about 14s. per hut, under the direct administration of the imperial government.

The preponderance of native races exists in Cape Colony and in Natal to a greater extent than in any other British possessions. In Cape Colony proper the latest census gives a population of 236,783 whites and 481,201 blacks. In Basutoland, out of a total of 128,176, only 169 are whites. In the Transkei territories of Fingoland, Giqualand East, &c., there is a population of 175,000, almost exclusively Kafir. And in Giqualand West, the diamond country, the blacks number 32,903, against 12,371 whites.

In the Cape Colony a black man enjoys all the rights of citizenship on terms of perfect equality with the white man; he possesses the parliamentary franchise, if otherwise qualified, and is under no legal disability whatever on account of his colour. Europeans, Malays, Hindus, Hottentots, Fingees, Kafirs, all have a fair field and no favour, and prosper according to their industry and sobriety. In no country is equality in the eye of the law, irrespective of race or colour, more thoroughly established; and to an appreciation of this fair and honorable treatment, and of the peace and protection assured them, is due the fact that the "natives," although so superior in numbers, have almost ceased to be an anxiety or a difficulty. The social separation of races is as complete as their legal equality, and it is remarkable in so motley a population that half-breeds are comparatively scarce, while actual marriage between a white and a black is a thing almost unheard of; white servants do not cat along with black, and Africans (whites born in Africa) are more exclusive than European immigrants.

There are a considerable number of negroes, descendants of slaves, introduced in earlier days, chiefly from Mozambique, a number of Malays in the seaports, originally brought from the Dutch possessions in the East Indies; and Hindu coolies, more recently brought from Bengal, &c., who settle here with their families, and in many cases become owners of land and employers of African labour.

As the black population are wonderfully peaceable and law-abiding, and in no country does the traveller enjoy a greater sense of personal security than in Cape Colony, where he can ride unarmed and alone, with his pockets full of diamonds, fearing neither black nor white. Diamonds to the value of many millions sterling have been sent down from the mines to the coast in the ordinary mail-bags by post-carrier, without an armed escort, with no guardian except a coolie driver, and highway robbery has never been attempted. The possession by theft of diamonds is in the mining districts a very common crime, and is punished with great severity; but the diggings, and the country generally, are singularly free from crimes of violence.

Government.—The government of the Cape Colony is European, the head of the administration being a governor appointed by the queen. He is also commander-in-chief of the troops, and is invested with powers beyond the limits of the colony proper. Since 1853 a responsible government has been established, and legislative power is now intrusted to a parliament formed on the British model, consisting of an upper and lower house of twenty-one and seventy-four members respectively. Members of both houses are elected by the same voters, who are qualified by possession of property, or receipt of salary of £50 per annum or £25 with bond and lodging.

The colonial revenue, which was £800,000 in 1871, had increased to £2,896,273 (excluding loans) in 1883-84, and is derived chiefly from customs. The debt, incurred principally for public works, amounted in 1885 to £20,000,000.

In addition to about 1218 miles of railway constructed out of this sum, numerous substantial bridges have been thrown across the river-courses, on the main routes of communication; so that traffic is not now, as formerly, dependent on the precarious prospect of fording the torrent rivers.

Each division of the colony forms a diocese of the Anglican church, with an episcopal seat at the capitals, Cape Town and Graham's Town. The state, however, assists all denominations, irrespective of creed, both for religious and educational purposes.

The total value of the imports to the Cape of Good Hope gradually increased from £1,588,393 in 1856, to £6,170,000 in 1883, and the exports from £1,327,175 to £1,100,000 during the same period. The trade is chiefly with the United Kingdom, as will be seen from the following table:—

	Exports to the United Kingdom.	Imports from the United Kingdom.
1880, . . .	£5,023,493	£1,978,074
1881, . . .	4,938,365	5,877,988
1882, . . .	5,859,691	5,989,601
1883, . . .	5,394,642	3,500,586
1884, . . .	—	—

The principal article received from the Cape is wool, the value of which is now estimated at £3,000,000 per annum. Ostrich feathers, sheep skins, and copper ore are the articles next in importance. The chief exports from the United Kingdom are apparel, cotton and woollen manufactures, and hardware.

Divisions and Chief Towns.—For the purpose of electing representatives for the Parliament the colony is divided into seven provinces and thirty-two divisions. The metropolis of the colony, the seat of government, and the great commercial entrepôt is CAPE TOWN. The second town of the colony is Port Elizabeth, on Algoa Bay, in the east, a bustling seaport full of warehouses and stores. Huge bullock waggons bring down the wool and hides from the interior farms for shipment here, and return inland with merchandise for the villages. Lines of railway unite Port Elizabeth with Graham's Town, the chief place in the interior north-east of it, and with Graaf Reinet in the farming country on the east of the Great Karoo. King William's Town is the chief place in the fertile territory formerly known as British Kaffraria, and is the chief town on the eastern border. It carries on a considerable trade through its port of East London.

Discovery and Settlement.—Bartholomew Diaz, the Portuguese navigator, first sighted the Cape in 1482, when in search of a route to India, and called it the Cape of Storms. Looking at its discovery in another light, as revealing a prospect of the realization of the long-looked-for route to India, King John II. changed the name to that of the Cape of Good Hope. In 1497, Vasco di Gama, another Portuguese navigator, rounded this "Cape of Good Hope," and was the first to sketch out to the world a rough outline of South Africa, by sailing northwards along the eastern coast to Zanzibar.

Some attempts were made by the Portuguese to settle in the neighbourhood of the Cape, but as the principal reason for so doing would be the establishment of a place of call on the way to the seats of their commerce in India, and they had a more convenient calling-place in Brazil, the attention paid to the Cape was not very great. The colony was virtually founded in 1652 by the Dutch, who were then losing their hold upon South America, and perceived the necessity for an alternative halting-place on the road to their possessions in the Indies. The Dutch had then considerable colonial possessions, and they established themselves on the slopes of Table Mountain by way of affording their ships a depot on the voyage to the East. The natives surrounding this small possession were Hottentots, a feeble

and diminutive section of humanity, quite incapable of organization, and consequently of effectual resistance to foreign intrusion. So the Dutch had no great difficulties, though their occupation of the country gave rise to constant small feuds; and immigration from Holland took place to such an extent that the basis of the population of this part of Africa became Dutch, and is virtually so to this day.

At the beginning of the present century the Dutch had extended their hold of the country as far as the Great Fish River, and westwards in an indefinite wavy line across the toe of the continent, so as to comprise an area equal to that of the British Isles.

In 1795, as an incident of the war then proceeding between England, France, Spain, and Holland, a British force seized the Cape Colony in the interests of the Prince of Orange; but it was restored to the Dutch in 1802 under the treaty of Amiens, which aimed at settling the colonial possessions of the belligerent parties on an abiding basis. The settlement, as is known to history, barely lasted a year; and one result of the renewed war which began in the following year was that the English seized the Cape Colony a second time in 1806, and we have held it ever since. In extending their possessions, during the later part of their occupation, the Dutch had come into contact with other natives than the Hottentots; and when the British seized the region they found themselves with a reckoning to settle with the Kafirs, the occupants of the eastern portion of the country. The Kafirs are a tall, fine race of men, warlike and predatory, of Arab extraction—a great contrast, both in physique and morals, to the poor Hottentot, and were by no means disposed to acquiesce in being ousted from their territory. Consequently the transfer of the Cape Colony from Holland to England was followed by a series of Kafir wars, which were chronic from 1798 to 1852, but of which six are usually reckoned, those of 1812, 1819, 1828, 1834–36, 1846–48, and 1851–52.

In the earliest of these struggles the Great Fish River was the line on this and that side of which the tide of war fluctuated. In 1811–12 this stream was the boundary of our dominion. The Kafir war of 1819 was precipitated by one of their "prophets," Makanna by name, under whom the Kafirs penetrated to Graham's Town, but were there conspicuously defeated. For seven or eight years after, the European population were not molested, and occupied themselves in pushing forward Hottentots and a few colonists to the frontier as a precaution against future attack. An outbreak in 1828 ended in the Kafirs being driven from the Kat River Valley; and Hottentots were again moved forward, under settlers of European origin, as buffers for the future, into the well-wooded and fertile district which is watered by this branch of the Great Fish River. A chief named Macomo was the leading figure on the side of the Kafirs in this period of the struggle. The valleys from which the Kafirs were expelled were settled with Hottentots and others by the London Missionary Society. Of the next struggle, that of 1834–36, it is only necessary to say that the Kafirs were driven over the Great Kei.

Sir B. Durban, from whom the well-known port in Natal takes its name, was the English administrator concerned in this stage of the war. He settled the new frontier with *Fingoes* or *Amangwas*, a docile set of natives, of mixed origin, refugees from wars with fiercer tribes, or the offspring of captives reduced by such tribes to slavery. These Fingoes are an interesting section of the very mixed population of South Africa. Temporary slavery, or their origin from the less war-loving individuals of the Kafirs—for the Fingoes are only Kafirs separated from the bulk of their race—seems to have made them prudent and peaceful; they are quietly acquisitive, and have been called the Jews of South Africa.

The Kafir war of 1834–36 cost upwards of £1,000,000

sterling. The next outbreak in a struggle of which the latest phase was the Zulu war of 1879, occurred in 1846, when the Kafirs overran the country as far west as Uitenhage and northwards to the Storm Mountains, before the settlers could offer any solid resistance. Under Sir H. Smith, however, our disturbing rivals were once more driven back over the Great Kei, and British Kaffraria began its existence as a distinct dependency.

The next and last Kafir war—the last, that is to say, unless we count the struggle with the Zulus a continuation (as it virtually was) of the series—began in 1850, and had this unprecedented feature, that the hitherto docile Hottentot population, settled on the Kat River and thereabouts by the London Missionary Society and the colonial authorities, having got it into their minds that they were to be dispossessed of their farms, made common cause with the Kafirs, expelled the missionaries, and joined in the invasion of the European settlement. Repulse followed, after a struggle of some length, and under the administration of Sir George Grey, the power of the Kafir chiefs was so broken up and the country so planted with European settlers that peace was permanently secured. This result was much accelerated by the impoverished condition of the Kafirs, who had killed their cattle at the bidding of one of their "prophets."

What was known as British Kaffraria, thus originating, is one of the finest portions of the colony, having an area of 4500 square miles, bounded by the Great Kei, the White Kei, and the Keiskamma Rivers, and the Amatola Mountains, a picturesque range varying from 4000 to 5000 feet high. Inland, on the north-west, among the Amatola Mountains, are fertile valleys and table lands, affording fine grazing ground; but the rivers, like those of nearly all South Africa, are unavigable and a torment. In 1859 farms of 1000 to 3000 acres were carved out and allotted to settlers; in 1861 it was declared a colony by letters patent, the governor of Cape Colony being appointed its high commissioner, and its administration more immediately superintended by a lieutenant-governor. After the Crimean War the German Legion, raised by England as auxiliaries, received grants of land in British Kaffraria, and were added to the European population. One of its towns is called Berlin, another Hamburg. The capital, King William's Town, contains some 3000 white inhabitants. There is a port, East London, at the mouth of the Buffalo River, and a railway there extends inland to Queenstown, with a branch to King William's Town. In 1868 this fine territory was more definitely annexed to Cape Colony, and ceased to have independent existence, except as forming the *Eastern Province* of that dominion.

The discovery of diamonds in the districts north of the Orange River, in 1867, drew the attention of the whole world to the colony, and gave new life and impetus to every branch of industry, leading to the annexation of the large territory of GRICUALD AND WEST to the British crown. The Basutos, a division of the Bechuanaland Kafirs, occupying the upper valleys of the Orange River, had subsisted under a semi-protectorate of the British government from 1848 to 1854; but, having been left to their own resources on the abandonment of the Orange sovereignty, they fell into a long exhaustive war with the Boers of the Free State. On the urgent petition of their chief, Moseshi, they were proclaimed British subjects in 1868, and their territory became part of the colony by Act of Parliament in 1871. [See BASUTOLAND.] More recently, in 1874 and 1875, the greater part of what was known as Independent Kaffraria, the Transkei territories of the Fingo and Tambeekie tribes, and the territory of Griqualand East, on the southern border of Natal, also came under British rule by the free consent of their inhabitants. [See KAFFRARIA.] In this way the Cape Colony has become continuous with the second important British colony of South Africa, NATAL.

CAPE HORN, the most southern point of America, on Hermit Island, the last of the Fuegian group, in lat. 55° $58'$ S., lon. 67° $16'$ W. It is a precipitous headland, from 500 to 600 feet high, is composed of dark bare rock, and has pointed summits. It was named by Schouten, the discoverer, after the town of Hoorn, where he was born, and changed afterwards to Horn. It is called simply "the Horn" by English seamen. The strong west gales which blow from October to April in the neighbourhood of this cape render it difficult to be doubled from the east.

CAPE LA HOGUE, a headland of France on the peninsula of Cotentin, 10 miles N.E. of Valognes. It was of this headland that the French were defeated, in 1692, by the united English and Dutch fleets. It is often confounded with Cape La Hague, on the same peninsula.

CAPE OF GOOD HOPE (Howe) was discovered in the end of 1486 by Bartolomeo Diaz, a Portuguese, and named the Cape of Storms. His patron, John III., gave it its present happier designation. It is 1900 feet in height, of similar structure to Table Mountain, and has a light-house near the summit; lon. 18° $29'$ E., lat. 34° $22'$ S., or $29'$ further N. than Cape Agulhas. Vasco da Gama conducted round it the first expedition to India in 1497. In the

expedition Diaz had command of a ship, as guide; but a violent storm occurring a little north of the Cape, several of the ships were wrecked, among them that of Diaz, who perished with his whole ship's company. The expedition is celebrated in the great epic of Camoens.

CAPE TOWN, the capital of Cape Colony, South Africa, founded by the Dutch in 1650, is at the S.W. angle of Table Bay. The streets of the old central part are regularly built at right angles to one another, but the extended town is irregular. The principal thoroughfares have rows or clumps of trees in the Dutch style, and some of the old street canals still remain. The houses are of stone, those of old erection with flat roofs, and are painted or white-washed. The vicinity, especially towards Simon Bay, has many handsome villas and suburban villages. There is an abundant supply of good water, and the town is very healthy; invalids, indeed, occasionally resort hither from India, and are generally much benefited. The heat, however, is often excessive. The town is sheltered on the S., S.W., and E. by high precipitous mountains, which overhang it; and it faces the mid-day sun, which, in latitudes south of the tropic of Capricorn, is of course always due north at noon. The south-east winds, besides, are very annoying in the



Cape Town, from Table Bay.

months of summer; they blow with great force, and are attended with a penetrating sand. The inconveniences are much less felt in rural districts, especially on the east side of Table Mountain, where the temperature is 10° to 15° higher than on the flat-tops of the Southern Ocean have frequently. By the construction of a long breakwater, in 1859, though still a wharve on the west side of the bay, the harbour has been made, with considerable success, a safe anchorage, and consequently greatly increased. The depth of water is 21 fathoms; rise of tide, 6 to 7 feet. The city contains 100,000 inhabitants, the government houses, and a water reservoir, with fine grounds and large flower-trees, and also a well-equipped observatory, which has been recently worked; a fine museum (with public library of 50,000 volumes), and botanic garden; a literary society, called the South African Institution; a college, public free schools, many other useful institutions, and many handsome churches. The town is

defended by four batteries and a strong castle, which command both the bay and the advances by land. Cape Town is 52 miles north of the Cape, and the southern suburbs extend 11 miles, in a great number of growing villages, as Mowbray, Rondebosch, Newlands, Claremont, Wynberg, and Constantia. The mean temperature of the year is 64° F.; in summer, 76° ; winter, 58° . In the population is included that of Robben Island, north of Table Bay. Population, 35,000.

CAPE VERD ISLANDS, ten islands in the Atlantic, divided into two groups, called respectively the Windward and Leeward Islands. The former, and most northerly, group is composed of San Antonio, San Vicente, San Nicolao, Sal, Boa Vista, and the rarely inhabited island of Santa Lucia; the second group comprises Santiago, Mayo, Fogo, and Brava.

Until quite recently this province included the Portuguese possessions on the coast of Guinea, but they were

formed into two separate provinces in 1879. They extend between 17° 13' and 14° 45' N. lat., and 22° 45' and 25° 25' W. lon. The coasts are low, but the central parts of the islands rise to a considerable height. They are all of volcanic origin; in Fogo there is still an active volcano. The climate is varied by droughts and extreme heat from November to July, and with rain, fogs, and thunderstorms during the rest of the year. Sometimes there is no rain for two or three years. The soil is generally dry, and in many parts rocky and barren. Maize and rice, the chief food of the people, oranges, mangoes, melons, pomegranates, bananas, lemons, figs, guavas, and the castor-oil and indigo plants, are the chief products. The fruits are of the best quality. Sweet potatoes are grown; the coffee plant, the sugar-cane, and the vine are cultivated, but it is prohibited to make wine. The palm, tamarind, and adansonia are the principal trees. The domestic animals are asses, goats, and poultry; among the wild animals are monkeys and bismarcats; turtles are abundant in the neighbouring seas. Salt is made from sea-water by solar evaporation, and is an important article of export to America and the coast of Africa. This industry was first worked by the Flemings in the middle of the sixteenth century. The production is now to some extent falling off, though the amount annually exported is still about 250,000 bushels. Archilla is gathered for the government. Besides salt and the products above named, the principal exports are pinguia nuts (the oil of which is used in making soap), coral, hides, and goatskins. The principal imports are cotton, linen, and woollen goods, hardware, wine, glass, and general provisions. The valuable cinchona tree is cultivated in small quantities in some of the islands.

The whole group is under the government of a governor-general, and there is a principal judge for the Windward Islands, and one for the Leeward. The punishment of transportation of criminals from Portugal to this province is much dreaded. The entire population of the islands in 1883 was 100,000.

• Branco, Santa Lucia, and Raza are bare, rocky, and uninhabited. Sal, though barren, is important for the quantity of salt collected along the lagoons on the coast. Its only verdure, as in the case of some of the other islands, is the archil lichen, from which a red dye is obtained. Ribeira Grande, on the island of Santiago, is the capital of the island, and the seat of a bishop and of the Portuguese governor. Owing to the unhealthiness of Santiago, a decree was passed in Lisbon in 1850 to remove the capital to São Vicente, but it has not as yet been carried into effect. Porto Praya, on the south coast of the same island, and Porto Grande, on the principal harbours.

The islands were discovered in 1441 by the Portuguese, by whom they were soon after settled, and to whom they still belong. The inhabitants are mostly negroes, mixed with some mulattoes, descended from the Portuguese settlers. They are all Roman Catholics, and speak a bastard Portuguese language. All the islands are in need of roads, but in that of Santiago a good carriage way has been made, connecting the northern districts with the port, at which a new pier was opened in 1880, and in San Antonio there is a good coast road.

San Vicente is of great importance as a coaling station, and is in telegraphic connection with Europe and America.

CAPE WRATH is the N.W. extremity of Scotland, in the county of Sutherland. It is a pyramid of granite, intersected by granite veins. Some of its faces rise perpendicularly to a height of 600 feet, whilst it is broken into deep fissures and lofty pinnacles, one of which, the *Star Rock*, is 200 feet high. Near to it is a lighthouse, 100 feet in height, whose light can be seen for 25 miles.

CAPELIN (*Mallotus villosus*) is a small fish of the SALMON family, in the order *PYROSOMI*. It is caught in immense numbers on the coasts of Kamtschatka and of

Arctic North America by the natives, who consume it fresh, or dry it for use in the winter. It is used largely as bait in the cod fishery. The body, which is about 9 inches in length, is deep-bodied and covered with small scales. The anterior dorsal and the ventral fins are situated rather behind the middle of the body; the pectorals are large and rounded, and abduct meet beneath. The following account of its habits is taken from the *American Naturalist*:—"It visits the shores of America during August and September for the purpose of spawning, when it is so abundant as to darken the sea for miles. There are some peculiarities about the method of its spawning; the females, on approaching the beach, being attended by two males, who hold the female between them by a cane of the ridge of closely set bony-like scales, with which all the males alone are provided, so that she is thus securely concealed. In this state the three run together with great swiftness upon the sand, and in this act the spawning is from the female, which is simultaneously fertilized.

CAPEL'LA, or *Amigæ*, a star of the fifth magnitude, in the body of the Goat, borne by the Character (*Amigæ*) in his arms. (See *PLATE CONSTELLATIONS*, N. Hemisphere, between the numbers v. and vi. and close to Gemini.) *Capella* is Latin for she goat, and symbolizes the goat Amalthea, raised to heaven for the assistance rendered to the infant Zeus. This is the fifth brightest star in our heavens. The other four are, Sirius, the brightest, *Caropus*, *Areturus*, and *Rigel*. The parallax of *Capella*, by Bessel's method, is ascertained to be 0.046, which would give its distance from the earth as 1,500,000 times as great as that of the sun.

CAPERCAIL'ZIE or **CAPERCAILLIE** (Lat. Scot. Name for the Wood Grouse or Cock of the Woods, a *Tetrao urogallus*). This noble bird was once indigenous to the Islands, and till lately frequent in the Islands of Scotland and some of the districts of Ireland, but the forest which once sheltered it have been cut down or so much reduced, and from this cause and others it appears to have been gradually exterminated. Within the last forty years it never



Capercaillie (*Tetrao urogallus*), male.

various attempts have been made to introduce the species again into the woods of the Highlands. Among others who made these experiments were the late Earl of Elibank and the late Marquis of Breadalbane. The result has been that this bird is now quite plentiful in certain parts of Scotland. The capercaillie is abundant in Norway, Sweden, Russia towards Siberia, and the north of Asia.

The male capercaillie is equal in size to a turkey, and weighs from 12 to 15 lbs. The female is only two-thirds of the size of her mate. The breeding season commences

early in the spring, before the snow is off the ground. At this period the cock stations himself on a pine, and commences his call to the females. This call is termed *play* in Sweden, and is heard from the dawn of day till the dusk of the evening.

The play of the capercaillie is not loud, and should there be wind stirring in the trees at the time, it cannot be heard at any considerable distance. Indeed, during the calmest and most favourable weather it is not audible at more than 200 or 300 paces.

In the male the windpipe makes a loose fold of two curves before it enters the chest, giving thereby a great increase of length. It is simple in the female.

The male is mottled with gray and brownish-black, but has the neck and breast black, with a greenish gloss; the female is of a pale yellowish-brown colour, with white and blackish-brown markings. The bill in the male is white, and in the female brown; and the male has a patch of bright scarlet naked skin over each eye. The tarsi are feathered down to the base of the toes. All the claws on each foot are armed with stout whalebone-like projections. According to Buckland these are not for the purpose of climbing the pines, as is the lion, but aid in supporting the capercaillie's heavy body on the snow, which for many months of the year covers the regions he inhabits.

The capercaillie is capable of domestication, and breeds readily in captivity.

The hen makes her nest upon the ground, and lays from six to twelve eggs, and her young keep with her till the approach of winter. The young cocks separate from the mother before the hatching. The food of this species consists principally of the berries of the Scotch fir, rarely those of the spruce, also of juniper berries, cranberries, blueberries, &c. and especially in winter the buds of the birch. The young are sustained at first on ants and their larvae, worms, insects, &c. In the early part of spring the London markets are supplied with capercaillies in abundance from Norway, following to the equator of steam navigation, the birds are perfectly fresh. The flesh, especially that of the female, is excellent.

CAPER NAUM was among the field of repentance, or "the city of comfort," was an ancient city of Galilee, about 70 miles distant from Jerusalem, in the north-western part of the Sea of Tiberias. It was here that Christ centred his apostolic ministry, and many neighbourhood legends are told of his work on the Mount. No town now exists on the spot, and the site on which it stood is a matter of dispute.

CAPER SPURGE is the *Euphorbia Latharis*, belonging to the order Euphorbiaceae. The capsules of this plant are frequently pulled by the cottagers in the country, and used as a substitute for caper; but the most common use is for the plant possesses a most active purgative principle, although this acid principle is modified or destroyed by the process of pickling. The berries are as safe as an article of dietetic use. The seeds of the plant yield a mucilage. The plant grows 2 or 3 feet in height, and is known amongst our British spurge by its opposite leaves.

CAPERS is the product of the shrub *Capparis spinosa*. The plant grows naturally upon rocks and ruins all over the south of France, and the East, rendering them inconceivably fertile, and its large white blossoms, from the centre of which there is a strong, long tail of deep blue stamens. The flowers, when constituted the *capers* of the shops, the quality of which depends exclusively upon the age at which they are picked; the smallest and youngest being the most delicate and the largest and oldest the coarsest and least useful. On an average each plant of the caper-bush gives a pound of buds. The consumption of capers in this country is inconsiderable. The best imported are from Toulon, in France.

Dean Stanley says of this plant:—"The *lasaf* or *asaf*, the caper plant, the bright green creeper which climbs out of the fissures of the rock in the Sinaitic valleys, has been identified on grounds of great probability with the 'hyssop' of Scripture, and thus explains whence came the green branches used, even in the desert, for sprinkling the water over the tents of the Israelites." See **CAPPARIDACEAE**.

CAP'ET, HUGUES or **HUGH**, the founder of the third, or, as it has been called from him, the Capetian dynasty of French princes, of whom little authentic information is preserved. His own great chief, as Count of Paris, gave him considerable predominance; and on the death, in 987, of the last of the Carolingians (Louis V., *le Fainéant*, *he*, the Slothful), he was declared king by the popular voice, and, with the sanction of the pope, was crowned at Rheims. Both the dates of his accession and of his death are uncertain, but the former is usually fixed in 987, the latter in 996. Thirteen kings (fourteen if we include John, who lived about eight days, and was never crowned), directly descended from him, in turn filled the throne, and it was not until 1328, on the death of Charles IV. without male issue, that the sceptre was transferred to the Valois family.

CAP'IAS. This term denotes in law certain writs so called from the occurrence of the word *capias* (that you take) in the ancient Latin forms:—

Capias ad respondendum.—This was a judicial writ by which all *personal* actions (that is, such as do not relate to land or real property) were commenced in the superior courts of common law against any person whom it was intended to arrest. In form it was a command from the king to the sheriff to take the defendant, if he should be found in his bailiwick, and him safely keep until he should have given bail, or made a deposit according to law in a specified action at the suit of the plaintiff, or until the defendant should by other lawful means be discharged from custody. By the Uniformity of Process Act (2 Will. IV. c. 39) this writ was practically abolished; and now, by the Common Law Procedure Acts (15 & 16 Vic. c. 76 England, and 16 & 17 Vic. c. 113 Ireland), writs of summons in England, and writs of summons and plaint in Ireland, are substituted for it. It is still used, however, against a defendant against whom there is a cause of action to the amount of £50 or upwards, and who, there is reason to believe, is about to quit the country and so defeat justice.

Capias ad satisfaciendum, usually called a *ca sa*, is a writ of execution to imprison the defendant, after judgment has been obtained against him in those instances in which it is still lawful to do so, and he make satisfaction to his creditor. It commands the sheriff to take the defendant, and him safely keep, so that he may have his body in court on the return of the writ to satisfy the plaintiff.

Capias ad satisfaciendum to fix the bail.—When the defendant is at large after the judgment, and the bail are responsible, it is often of importance to fix them with the debt; for this purpose a *ca sa* is sued out against the principal; but the *ca sa* is merely intended as a notice to the bail of the plaintiff's intention to proceed against them; and, if they do not render their principal in time, the plaintiff may proceed for the debt against the bail.

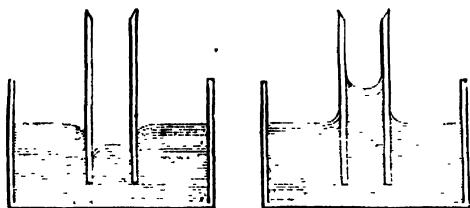
Capias adligatum is a writ that lies against a person who has been outlawed in any action.

CAPILLAIRE is a medicinal syrup prepared from the fronds of *Adiantum Capillus-veneris*, considered from time immemorial as a remedy for pulmonary complaints. In the Arundel MS. we read:—"It mundifyeth the lunges, and the breste, and ceceth out wykede maters in hem." The celebrated John Ray also recommended the maiden-hair fern for many diseases. The Canadian plant *Adiantum pedatum* is used in the same way, but is somewhat astringent. See **ADIANTUM**.

CAPILLARY ATTRACTION and REPULSION.

Ascent above or descent below the level of the surrounding fluid takes place when a capillary tube, i.e. one of very small diameter (like a hair, Lat. *capillus*), is dipped into water, mercury, &c. This phenomenon, which excited early remark from its apparent exception to the laws which regulate the equilibrium of fluids, has given its name to a theory of the action of the parts of solids and fluids upon each other.

The following diagrams represent the appearance (in section) of a liquid into which a tube of very small diameter is plunged. The liquid in the tube either rises above or sinks below the level of that on the exterior, and at the same time is slightly curved at its upper surface. It is also to be observed, that in cases where the liquid stands higher within the tube than without, as is the case with water (the tube being of glass), its upper surface is always



concave; but that, when the fluid is lower within the tube, as with mercury in glass, it is convex. It is not true, however, that the glass actually repels the mercury; but the attraction of the particles of mercury upon mercury is stronger than that of the particles of glass upon mercury, and the tube is not wetted. On the other hand the action of glass upon water is stronger than that of water upon water, and the tube is wetted. Between two parallel plates immersed at a very small interval, the liquid rises as high as in a tube with that interval for its radius. Between two plates vertically placed, but inclined at a very small angle (like a double screen nearly closed), the liquid rises higher and higher as we proceed towards the upright line of junction; and the curve of its upper surface is an hyperbola.

Experiments on capillary action have been made from the time of Newton; but it is only since the application of the molecular theory by Laplace that it seems to have been admitted that the internal coating of the tube immediately adjacent to the fluid is the cause of the phenomenon. The results of various observers upon glass and water give elevations of from 2 to 5 inches in a tube of one hundredth of an inch in diameter; but the elevations of fluids vary with the temperature, the former diminishing as the latter increases. It is by capillary attraction that lamps and candles burn, the wick acting as a bundle of capillary tubes.

CAPILLARY VESSELS or CAPILLARIES, so called from their hair-like minuteness (Lat. *capillus*, a hair). The bloodvessels of the body consist of arteries and veins, the arteries carrying blood from the heart, and the veins returning it to the heart. It has been shown [see **ARTERY**] that the arterial system is arborescent, that is, that the branches which spring from the aorta successively increase in number and diminish in size as they proceed from the heart towards their ultimate terminations in the system. These ultimate terminations of the arteries, together with the first origins of the veins, constitute a peculiar system of vessels termed the capillary system. These capillaries are too minute to be detected by the naked eye; but in the transparent parts of the body of a living animal, when brought under the field of the microscope, they become perfectly visible, as in the web of the frog's foot and the mesentery of the rabbit. The greater number of the arteries and veins are then seen to be directly continuous with each other, no substance intervening between the two orders of vessels; but the capillaries are totally distinct

both in structure and office from the trunks from which they spring. All the tunics of the capillary arteries diminish in thickness and strength as the tubes lessen in size, but more especially the middle or fibrous coat. It is also seen that the blood, as judged of by the movements of the corpuscles, passes in a continuous stream from the small arteries through the capillaries to the small veins. The velocity is greater in the arteries than in the veins, and greater in either than in the capillaries.

The flow through the capillaries varies very much. Some of the capillaries are large enough to admit of three or four of the red particles of the blood abreast, the diameter of others is sufficient to admit only of one, while others are so small that they can transmit nothing but the serum.

The velocity may possibly depend upon the calibre of the capillary. The velocity in the retina is 75 millimetres a second (Vierordt, quoted by M. Foster, "Physiology," London, 1879), elsewhere it is usually less. The flow is irregular also; for it may be observed that sometimes the red corpuscles follow one another in a steady stream in single file, in other capillaries one corpuscle will block the entrance for a time, and in others the corpuscles though passing do so slowly and unevenly. In those animals with long oval red corpuscles, the latter move end foremost; the circular corpuscles of the mammalia rotate freely as they pass through the capillaries. The flexibility and elasticity of a corpuscle are well seen when it is being driven into a capillary narrower than itself, or when it becomes temporarily lodged at the angle between two diverging channels. In larger capillaries the red corpuscles pass in the middle (where, as in all streams, the current is greatest), and do not touch the sides; the lighter white corpuscles—like chips on a stream—drift towards the edges, and are seen creeping along the walls of the capillary (Foster). The resistance to the flow of blood caused by friction against the walls of the numberless capillaries is their most important effect upon the flow of the blood; of course the flow is not only checked locally, but the resistance is passed along backwards in the arterial system, to be overcome by the ceaseless pumping of the heart.

As the capillaries are not muscular they expand when under the influence of a heavy pressure of blood, and shrink when the pressure is small. The notion is so widespread that the capillaries act by capillary attraction, as the lamp-wick sucks up oil, that it is perhaps necessary to point out the absurdity of a theory which would claim as an active agent that which a moment's thought would show to be a serious hindrance so far as it exists. Further, how could capillaries have at the same time the power to *draw in* at the one end, from the arteries, and drive out at the other, into the veins? Finally, the hypothesis is not only absurd but unnecessary, since the force of the heart has been proved, by actual computation, to be sufficient to drive the blood through the whole system of arteries and veins, including the extra expenditure of energy necessary to overcome the resistance of the capillaries.

If mustard or some other irritant be applied to the web of the frog's foot under examination, the inter-action of the capillaries and the tissues is well seen. If the stimulus is small, a blush is produced; that is to say a temporary congestion. The arteries quicken their flow and dilate, the capillaries become filled with corpuscles, and many small passages before unnoticed (as they admitted only the colourless serum) now come into view, and are forced to admit the pressing corpuscles. Presently, the stimulus ceasing, this all passes off, and the capillaries and veins return to their half-filled state. But if the stimulus is long-continued the pressure becomes too great for the capillaries and a block is produced, at last amounting to a cessation of flow; the capillaries are choked with corpuscles so tightly packed as to appear one solid mass. In a short time the tissue outside the walls of the capillaries is seen

to be crowded with white corpuscles, and on the side towards the veins with red corpuscles also. At present it is not quite clear how these pass through a surface which is not porous, and the latest theory is that a breach is made in the extremely thin capillary walls, which is at once healed after the passage of the corpuscle; much as a glacier flows by the constant fracture and regelation of the ice. This is the state of inflammation, which, if the tissue is healthy, gradually subsides on the cessation of the stimulus. It is thus made manifest that the capillary circulation in a part depends on the healthiness of the tissue in that part.

Such changes in the capillary circulation are one of the great means of modifying the circulation of the blood, so necessary to health. For it is considered that an active muscle would otherwise receive only as much blood as one which was at rest, or that the skin would be supplied on a cold day with as great a quantity of blood as in the heat of summer, such a power of modification is seen to be essential. Other means are—changes in the heart's beat, in the muscular energy of the arteries, and in the quantity of blood. See CIRCULATION OF THE BLOOD.

The physiological knowledge of the vital action going on in the tissues is yet vague. The fact is known to everyone, that in its process through the capillaries the blood communicates through their thin walls with the surrounding tissue, and having entered the capillaries rich in oxygen and scarlet in colour, is found in the veins beyond the capillaries loaded with carbonic acid and dark in colour. But whether the chemical change takes place in the blood itself, or in the tissues—that is to say, whether these latter absorb oxygen from the blood, as such, returning to it carbonic acid in exchange—is not finally determined. The weight of opinion derived from recent experiment is in favour of the latter theory.

CAPISTRUM (in Gr. *phorbion*), a leather bandage tightly fastened round the lips and cheeks, through the mouth bound in holes of which the mouthpieces of the double-flute were thrust. The purpose of the capistrum was to assist the player, and especially to soften the tone by preventing violent breathing. It was used particularly at the vocal representations, but rarely at banquets, though the comic tragedian painter, Alma Tadema, in his celebrated "S. S." introduces a female flute player with the capistrum. It was a very useful for the pipes.

CAPITAL is a term used in commerce to express the stock of the merchant, manufacturer, or trader, used in carrying on his business, in the purchase or manufacture of commodities, and in the payment of the wages of labour; it is understood not only of money, but of buildings, land, and all other material objects which facilitate the operations in trade. The term in this its commercial acceptation is sufficiently understood, and it is only of capital in the widest general sense that it is necessary to treat here. In this latter sense it may be defined as the accumulated products of industry possessed by the community, and available either for the supply of future wants, or for further production.

Capital is first divided into existence by the natural force of time, who even in a savage state discerns the advantage of accumulating for the future, and thus the whole produce of his labours in present gratification, and stores up a part for his future subsistence. The greater proportion of mankind possess this quality, and those who do not possess it are admonished of it, when by privation. A desire to accumulate some portion of the produce of industry being natural to mankind, then, where capital may be expected wherever the means of accumulation exist; or, in other words, wherever men are not obliged to consume the whole products of their labour in their own subsistence. From the moment at which a man possesses more than he consumes, he is creating capital; and the accumulated surplus

of production over the consumption of the whole community, so long as it exists in a form possessing a recognized value, is the capital of a country.

It is evident that capital must increase in the ratio in which the products of labour exceed the expense of subsistence, and it follows that the higher the rate of profit the greater will be the means of further accumulation. If 3 per cent. profit upon a man's stock will enable him to subsist as he has been accustomed, and to lay aside 1 per cent. annually as capital, the rise of profit to 6 per cent. would at once give him the power of adding 4 per cent., instead of 1, to his capital, so long as he made no change in his style of living; and thus the doubling of the rate of profit would add to the means of accumulation in the proportion of four to one.

The consideration of the application and uses of capital will be much simplified by explaining, at the outset, the distinction raised by political economists between what is called productive and unproductive labour and expenditure.

J. S. Mill (in his "Principles of Political Economy") defines productive labour as those kinds of exertion only which produce what is called material wealth; but he adds that while accepting this restricted definition, he intends to avail himself to the fullest extent of all that phrase conveys, and "will not refuse the appellation productive to labour which yields no material product as its *direct* result, provided that an increase of material products is its ultimate consequence. Thus, labour expended in the acquisition of manufacturing skill, I class as productive, not in virtue of the skill itself, but of the manufactured products created by the skill." The same writer elsewhere lays down the principle that the distinction between capital and what is not capital "lies in the mind of the capitalist—in his will to employ his commodities for one purpose rather than another; and all property, however ill adapted in itself for the use of labourers, is a part of capital so soon as it, or the value to be received from it, is set apart for productive reinvestment."

The first and most important use of capital is the division of employments, which without it is quite impracticable. Until there is a fund for employing labour, every man's business is the seeking of his own daily food; but as soon as the capital of another secures that for him, his labour is available for the general good. The more capital is accumulated, the more extended are the facilities for the indefinite distribution of employments, according to the wants of the community.

Not only does capital facilitate divisions of employment, and so increase the productiveness of industry, but it actually produces many sources of power and enjoyment which without it could have no existence. It is the foundation of all social progress and civilization, for without it man is but a savage. It must precede his mental culture, for until it exists his noble endowments are idle or misemployed. Capital was divided by Adam Smith into two great classes—fixed and circulating—and the usefulness of the distinction has been generally recognized by later political economists. Buildings, machinery, and all the more or less permanent instruments of production, are said to belong to the former class; whilst circulating capital includes the whole amount expended on wages, raw material, and articles which are only capable of being used once, and have therefore constantly to be renewed. The name "floating capital" is given to the money held by banks on deposit, and the amount of this is an extremely important index of the wealth and prosperity of a country. Without such a fund any undertakings requiring a large initial outlay before any return is received, such as railways or submarine telegraphs, would be impossible.

Having explained the origin and nature of capital, we will now, instead of entering further into the details of the subject (concerning which there always has been

considerable difference of opinion), proceed to state some of the soundest general conclusions which up to the present have been arrived at with regard to it. It is admitted on all sides, (1) that capital is the ally and not the adversary of labour, as sometimes appears to be thought; (2) that every increase of capital means increased employment for labour; (3) that as capital increases the rate of profit has a tendency to fall, competition between capitalists being fully as keen as between the men they employ—therefore, a certain amount of capital in an undeveloped country would, if wisely used, always be worth more than the same sum in one where capital was plentiful; and (4) that, in spite of this tendency, there is no real danger of the growth of capital being checked from this cause, even in the wealthiest and most populous countries (such as our own), while improvements can be made in methods of production, while increasing facilities of communication constantly cheapen articles brought from abroad, and while the diversion of capital to places where greater profits can be obtained still continues.

The paramount value of capital to the prosperity of a nation should never be overlooked by a government. Restrictions upon commerce, improvident taxation, and all laws unfavourable to its growth, should be dreaded as poison to the sources of national well-being. But while the natural growth of capital should not be interfered with by restrictions, the opposite error of forcing it into particular channels should equally be avoided. Industry requires from a government nothing but freedom for its exercise, and capital will then find its own way into the most productive employments; for its genius is more fertile than that of statesmen, and its energy is greatest when left to itself. The best means of aiding its development are a liberal encouragement of science and the arts, and a judicious system of popular education and industrial training; for, as "knowledge is power," so is it at once the best of all riches and the most efficient producer of wealth.

CAPITAL, in architecture, is the member crowning the top of a column, pillar, or pilaster, and forming its most characteristic part. The word comes from Lat. *caput*, a head. The principal varieties of capital will be best described under **COLUMNS**.

CAPITAL PUNISHMENT, the punishment of death (Lat. *caput*, a head), is now limited in the United Kingdom to the two crimes of high treason and murder. In Anglo-Saxon times we find capital punishment frequent in writing—as in Athelstan's Laws, where a theft of over twelvepence value is punishable by death. But in actual practice a fine was accepted, and some of the old ealdes even offer the alternative—"Let the thief be put to death, or let his life be redeemed in proportion to his *werigild*." This was the man's legal value according to his state in life—200 shillings for a coth, 1200 for a thegn, &c. Even murder itself was redeemable by paying the *werild* to the relatives of the murdered man. Alfred the Great first made treason a capital offence. Later kings added coining, brawling in the royal presence, sacrilege, and witchcraft to the list; until Ethelred (1008) felt forced to declare the death penalty to be too often enforced, and finally William the Conqueror abolished it altogether. Instead of it noses were slit, ears cut off, &c.—that is, some marked personal disfigurement for life was suffered by the criminal.

Henry I. restored death to the code, and just a century after Ethelred had made his royal protest against "Christian men for all too little being condemned to death," Henry Beauclerc decreed that the thief, the robber, and the coiner should be hung (1108); and the barbarous penalty remained until 1820. Forgers were hung till the first year of Queen Victoria. The eighteenth century was prolific in its additions of capital offences to the statute-book, no less than 160 different crimes being punishable with death up

to George IV.'s reign. That was happily marked at its commencement by a crowd of such severe laws being swept from the statute-book in 1820. Another attempt was made in 1823. Queen Victoria has had the glory, by the special Acts of 1837, 1841, and the final amendment in 1861, of seeing the criminal code brought to its present narrow limits.

The mode of putting to death is now by hanging, but it has varied considerably. Before the Conquest the judges had the choice of hanging, beheading, drowning, and burning; after the Conquest the two last were abandoned. During the middle ages witches were drowned, however; and heretics were always burned at the stake. The statute *De Heretico Comburendo* is the second of Henry IV. (1401). In 1531 Henry VIII. ordered poisoners to be boiled to death, but his successor repealed the brutal law at his accession in 1547. Burning at the stake was abolished in 1677. It is unnecessary to repeat the brutal and disgusting details called "drawing and quartering" which accompanied the earlier executions of traitors.

The latest legislation on the subject was the Act of 1848, creating the crime of treason felony not punishable by death, and limiting high treason, the capital crime, to offences actually against the sovereign; the Act of 1861 before mentioned; and the Act of 1870, abolishing forfeiture for treason, and reducing the punishment to death by hanging alone.

In the army and navy the punishment of death may be inflicted upon all persons detected acting as spies, upon any officer, soldier, or sailor found guilty of mutiny, treachery, cowardice, desertion, sleeping on watch or sentry duty, and for disobedience to any lawful command of a superior officer. The power of inflicting this penalty is vested in a court martial, but two thirds of the officers present must concur in the sentence to make it effectual. Criminals thus sentenced may be shot or hanged, the latter mode being considered more disgraceful than the former.

Sir Joseph W. Peto, Bart., obtained a parliamentary return in 1881, which sets forth on undeniable authority the penalties for murder in the principal countries of the world at that time. The following countries have relinquished capital punishment: Belgium, Holland, Finland, Portugal, Roumania, the province of Tuscany in Italy, Nassau, Wörmur, Württemberg, and Baden in South Germany, the states of Columbia and Venezuela in South America, and those of Michigan, Rhode Island, Wisconsin, Iowa, Illinois, Indiana, Oregon, and Tennessee in the United States. The state of Maine, U.S., the kingdom of Saxony, and the republic of Switzerland, after having abolished the death penalty, have re-enacted it. The countries retaining capital punishment do so with great laxity of enforcement.

CAPITANA TA, a province of the kingdom of Italy, also called Foggia, is bounded N. and E. by the Adriatic, W. by Benevento and Molise, S. by Basilicata and Principato Ultra, from which it is divided by the central Apennine ridge, and S.E. by Foggia di Bari. It corresponds to the ancient *Ugentum*, so called from Daunus, an ancient king of Apulia, rather-in-law of Diomed, who settled on this part of the country after the Trojan War. The length of the province from the mouth of the Biferno to that of the Ofanto is 75 miles, and the average breadth is about 15 miles. The north and east of the province are crossed by offshoots from the Apennine ridge, one of which, Monte Gargano, projects eastward into the sea, forming a peninsula, which from its shape and position has been called the Spur of Italy. All the rest is a vast plain, without trees, and known by the name of Tavoliere di Puglia; the slopes gently down from the Apennines to the Adriatic. The chief rivers are the Fortore, which enters the sea at Lake Lesina; the Candellaro, which is formed of several streams rising in the Apennines and in the offset which fills up the peninsula of Gargano, and enters the marsh

succoured, the governor of the place is justified in entering into an agreement with the besiegers respecting the terms on which he consents to deliver his charge into their hands; and by the rules of war, as well as from the regard due to a gallant adversary, he is entitled to obtain what is called an honourable capitulation. It may be observed that if the governor should postpone the proposals to surrender till his provisions are entirely exhausted, the besiegers may refuse to grant terms to the garrison, which must then surrender at discretion.

By the terms of a capitulation the arms and military stores in the place are generally given up to the besiegers, the officers and troops of the garrison retaining only their private property, and being allowed to march out with the honours of war—that is, with drums beating, colours flying, &c. When necessary, a convoy is allowed them for protection till they arrive at the place of their destination.

CAPITULUM is a head of sessile flowers, a particular form of INFLORESCENCE. The dandelion and all *Compositæ* have an inflorescence of this nature; it is vulgarly looked upon as a single flower.

CAPONIERE or **CAPONNIERE**. See BASTION.

CAPPADO'CIA is the ancient name of a country of Asia Minor, usually spoken of in two divisions. Cappadocia, bordering on the Taurus, often called Cappadocia simply; and Cappadocia bordering on the Pontus, often called Pontus only. In its comprehensive sense Cappadocia was bounded on the N. by the Pontus Euxinus (Black Sea), on the S. by Taurus, which divided it from Cilicia, on the W. by Paphlagonia, Phrygia, and Galatia, and on the E. by the Euphrates. Of the mountains the principal is the Taurus, which forms the southern boundary. Two other important chains, the Anti-Taurus and the Paryadres (Keldir), run nearly parallel from Armenia into the centre of Cappadocia, where they form the high mass of Mount Argæus (Argis-Dagh). Argæus is covered with perpetual snow. Darius Hystaspes is said to have divided Cappadocia into the two satrapies. The satraps appear to have been kings of the countries tributary to the Persian monarch, and hence an hereditary succession is observed. On the death of Artabanus, the last king, about A.D. 17, Cappadocia proper was reduced to a Roman province. Regarding the more famous sister monarchy of Pontus, see PONTUS.

Cappadocia proper has little wood, and is rough and mountainous. The part between Mount Argæus and Mazaca (Kaisarieli), and indeed most of this district, appears to have been the seat of volcanic action. The high tablelands of this country are admirable pasture land. It was famous for its horses.

CAPPARIDACEÆ, an order of plants belonging to the POLYPETALÆ, and included in the cohort Paniceales. They are thus closely allied to CEREALIA, but differ in the stamens not being tetradynamous, and generally numerous, and also in the reniform shape of the seeds. The sepals and petals are generally four. The ovary is superior, one-celled, with parietal placentas, and the embryo is curved on itself without albumen. They are shrubs or herbs, sometimes trees. There are about 300 species, natives of the tropics and warmer regions. Some of the American species of Capparidaceæ are very poisonous, others act as vesicatories, and a few are merely stimulant. To this latter class *Capparis spinosa* (the caper) belongs.

There are 120 species in the genus *Capparis*, which is characterized by the four petals, the stamens inserted at the base of a very short receptacle, the stalked berry, and the simple leaves. Besides the *CAPRI*, there is another species, *Capparis aphylla*, the fruits of which are used for food. As the name implies (*Gr.* *α*, not; *phyllon*, leaf), there are *no leaves* in this species except on the young shoots. The wood is very durable, and besides, not being subject to the attacks of white ants, on account of its

bitterness, it is used in its native country, India, for rafters, ploughshares, and also for tanning.

CAPREÆ. See CAPRI.

CAPREÆ or **CABRERA**, a small, rugged, rocky island, of moderate height, with sharp mountainous peaks, situated at the eastern entrance of the Straits of Bonifacio, contiguous to the coast of Sardinia, belonging to the Italian province of Sassari. The island, which is about 10 miles in circumference, became celebrated as being the residence of the renowned General Garibaldi, who died there on the 2nd June, 1882.

CAP'RI (the Roman *Capree*, or "island of goats"), a rocky island in the Mediterranean, is situated at the southern entrance of the Bay of Naples. It is composed of hard calcareous rocks, which are disposed in two masses with a considerable hollow between them. The highest of these two masses, which is to the west, rises to upwards of 1900 feet above the sea. The loftiest point is the Monte Solaro, 1980 feet above the sea-level; towards the east huge cliffs, about 900 feet in height, rise abruptly from the sea, and are crowned by the picturesque ruins of the *Villa Jovis*. At the base of Monte Solaro is the pretty little town of Anacapri, which communicates with the other town and all the east of the island by means of a steep flight of 538 steps, which is carried down the face of a precipice. The chief town, which is called Capri, stands much lower, on a shelving rock towards the eastern extremity of the island. The population of the island is about 6000. The products are oil and wine, both red and white, which are in great demand at Naples. Another important item of export consists of quails, which are annually captured at their season of passage in vast numbers. The whole circuit of the island is about 9 miles; but this narrow space is wonderfully crowded with a variety of scenic beauty and remains of antiquity. On the north side of Capri is the famous Blue Grotto, the entrance into which is by a fissure in the precipitous cliff only extending just above the sea level, so that visitors can only enter by lying down in their boat, and in rough weather cannot enter at all. In consequence, practically the whole of the light which reaches it passes through the water and is reflected up to the roof, and the cavern is illuminated with a blue radiance indescribably beautiful to witness.

Capri is famous in history from having been the retreat of the Roman Emperor Tiberius, who retired from Rome in the year A.D. 27, at the age of sixty-eight, and very rarely quitted the island till his death (on the neighbouring mainland) in the year 37. He was most probably led to select this spot for his favoured residence, as well from the difficulty of its access as from the mildness and salubrity of the climate, and the univalued magnificence of the prospects which it affords. He is said to have built no fewer than twelve villas, named after the twelve greater or Olympian deities, in different parts of the island, some close by the sea, and others in more elevated situations (Lucit. "Annal." iv. 67). The accuracy of the statements of Tacitus and Suetonius, as to the private life of the emperor in Capri, is now greatly doubted. Professor Beesly had the merit of first pointing out that a man nearly seventy, not till then for the austerity of his manners, does not plunge into the wildest debauchery, or if he does he certainly does not live till nearly eighty. [See J's "Carthage and Tiberius." London, 1878; see also the article *TIBERIUS*, where the point is more fully treated. Augustus was also very fond of Capri, and built a villa in the island.

In 1803, during the Napoleonic wars, Capri was captured by the English, under Sir Sydney Smith, fortified, and converted into a miniature Gibraltar. Sir Hudson Lowe was afterwards the commandant. In October, 1808, however, the island was recaptured by the French, under Lamarque, by a brilliant *coup-de-main*.

man. In Europe the capsicum enters largely into the seasoning of food and the preparation of pickles; and in warmer countries it constitutes one of the first necessities of life, either green or ripe.

There are fifty species of the genus *Capsicum*, herbs, sometimes shrubby, with entire leaves. The flowers are solitary, or there are two or three together. The calyx is short, scarcely increasing during the ripening of the fruit. The corolla is rotate with five deeply cut valvate lobes. There are five stamens with anthers of about the same length as the filaments, the cells dehiscing longitudinally. The fruit is indehiscent, and generally not juicy. The seeds are flattened, and the embryo is much curved. De Candolle is of the opinion that many of the so-called species are only varieties arising from cultivation, and that they are all of American origin. The species from which the fresh capsicums used in Europe are principally obtained is the *Capsicum annuum*, a weedy plant found wild in South America, but cultivated in Europe before the middle of the sixteenth century. The flowers are solitary; the fruit oblong, generally of a brilliant scarlet, and 2 or 3 inches long. These capsicums are also called chillies. *Capsicum fastigiatum* is the principal source of Cayenne pepper, and is chiefly imported from the East Indies and Africa. Hence it is called East Indian, African, or Guinea pepper. In this plant there are two or three flowers together, and the fruit is small, only $\frac{1}{2}$ to $\frac{3}{4}$ inch. As a condiment, capsicums promote digestion and prevent flatulence. In tropical countries they form a necessary article of food. As a medicine they act as a general stimulant, rubefacient, and vesicant. They are useful in atonic dyspepsia and paralytic affections, and in the West Indies are in great repute for scarlatina.

CAPSTAN, an appliance used on board ship for raising the anchor or any very heavy weight. Until recent years it was invariably made of wood, but all now in use in the royal navy and on the best trading ships are of wrought iron. A capstan consists of a *drum-head* pierced with numerous holes, into which can be fitted long wooden bars, and a *barrel*, round which the cable is coiled, both working upon a vertical spindle firmly secured to the deck, and having very firm supports on the deck underneath. In addition to the barrel, modern improved capstans are fitted with *rollers* and *whelps*, by means of which a chain cable can be pulled up without danger of slipping. In the drum-heads of the largest of these instruments there are about twenty holes for bars, and as three or four men can stand to each bar, when fully manned between seventy and eighty men can be employed. In some cases the spindle is carried through to the deck below, and another capstan is fitted up there, which can be arranged to work either separately or in conjunction with the one above. In steam vessels great improvements have been made in the arrangement and action of capstans, and it is now usual to drive them by steam power, generally applied by means of a pair of small cylinders placed at right angles to each other, and acting on the same crank.

CAPSULE is the name given by botanists to a dry seed-vessel containing many cells and seeds, opening generally by valves.

CAPSULES (from Lat. *capsula*, a little box), small vessels or cells, generally made of gelatine and sugar, used to inclose medicines of a nauseous character.

CAPTAIN (from Lat. *caput*, a head), in the navy, is an officer who has the command of a ship of war, and in the army one who commands a troop of cavalry or a company of infantry.

In military affairs the title of captain was originally applied, both in France and England, like that of general at present, to officers who were placed at the head of armies or to the governors of fortified places. In the English service it was first introduced, in the sense in which it is at

present used, during the reign of Henry VII., when it was borne by the officers commanding the yeomen of the guard and the band of gentlemen pensioners. To a naval captain on service is intrusted the important charge of a ship of war, with its artillery, stores, and frequently a numerous crew; and, since its transfer to the enemy would, by so much, increase his strength, it is evident that nothing but utter inability to defend it can justify a surrender. The rank of post-captain was that at which the promotion of the commander of a ship to a *flag* took place by seniority; but the title does not now exist. Several petty officers in a ship bear the title of captain. Thus there is a captain of the fore-castle, a captain of the hold, captains of the main and fore tops, and of the after-guard. In the army a captain is the highest of the so-called regimental officers, and he is responsible for the efficiency of his company; he attends all parades, and observes that the clothes, arms, &c., of the men are in good order; he also superintends the supply of their pay and allowances. Lieutenants of ships of war rank with captains in the army, commanders rank with majors, and captains with lieutenants; but, after three years from the date of their commissions, they rank with full colonels.

CAPUA, the capital of the province of Caserta, Italy, is situated in one of the richest parts of the Terra di Lavoro, in a plain on the left bank of the Volturno. The population in 1882 was 13,886. It is 15 miles north-west from Naples, on the highroad to Rome, about 12 miles from the embouchure of the Volturno, and 10 from the nearest part of the Mediterranean. It is strongly fortified. It has a cathedral dating from the eleventh century, and is the residence of an archbishop. In 1501 a sanguinary attack was made on Capua by Caesar Borgia, when 5000 lives were sacrificed. On the opposite side of the Volturno is the battlefield on which King Francis II. met with a defeat by the Garibaldians and Piedmontese in 1860.

The modern city does not stand upon the same ground as the ancient, but it occupies the site of a much inferior town, called by the Romans *Civilianum*; and Santa Maria di Capua, a larger and more prosperous town than Capua itself, covers part of the ground of the ancient city of Capua. Santa Maria is nearly 2 miles higher up the Volturno, and at this point the remains of its amphitheatre, said to have been capable of containing 100,000 spectators, and of some of its tombs, attest its ancient splendour and magnificence. Capua was one of the Etruscan cities founded on this coast, and its old name was *Vulturnum*. When it fell into the hands of the Samnites it took the name of Capua. [See CAMPANIA.] In the war with Hannibal the Romans formed the siege of Capua, which adhered to the side of that general, who had taken up his winter quarters here after the campaign of Cannæ. It has been said that this was a false step; that he ought to have marched direct from Cannæ to Rome, and that his soldiers, enfeebled by their residence in this luxurious city, henceforth lost their former superiority. But there seems to be little or no foundation for these statements. Hannibal, though victorious at Cannæ, was so far from being able to attack Rome, that he was repulsed in an attempt upon Naples; and the fact that he maintained himself, without assistance from home, for a dozen years in Italy after he had wintered in Capua, and defeated, during that period, several Roman armies, completely negatives the idea of his troops having been enervated. When the place was taken by the Romans, the senators were put to death, and the bulk of the citizens sold for slaves. Capua at this time was probably a larger city than Rome. After the Second War the town recovered all its privileges, though it never regained its former political influence. Capua became a Roman colony under Julius Cæsar, and the *Colonia Agrippensis* was divided among 20,000 Roman citizens. It again increased in wealth, but was nearly destroyed by the

Vandals under Genserik, 456 A.D. The city was finally destroyed by the Saracens in 840. In the outskirts of Santa Maria, and on the roads that branch off from that town to Capri, Caserta, Naples, and Nola, there are many ancient tombs; and the whole of this district, taking a diameter of 10 miles, abounds more than any other part of Italy with these ancient vases vaguely called "Etruscan."

CAPUCHIN is the name given to a group of South American MONKEYS belonging to the genus *Cebus* in the order QUADRUMANA. In their general form they resemble the HOWLERS (*Myiotes*), but are always of smaller stature and less robust form. Their heads are short and rounded, and their tails, although prehensile, are destitute of the naked space at the extremity, which gives that organ, in the howlers and spider-monkeys, such a firm grasp of any object round which it may be coiled. Their hands are furnished with perfect thumbs, both on the fore and hind limbs, but the thumbs on the fore limbs are not opposable. The facial angle is about 60°. In nearly all the species the face is bordered by a profusion of long hair, which gives the little creatures a most forbiddingly-whiskered appearance, and the top of the head is often similarly provided. The capuchins are very active, climb admirably, and are altogether well formed for an arboreal life. These monkeys live in troops in the boundless forests of the South American continent, where they feed upon fruits, seeds, insects, and corn, and also upon small birds and their eggs. In their turn they furnish a considerable portion of the food of the small carnivorous quadrupeds, such as the coecots, which abound in the American forests, and which are very suberbal in their habits. They are of a gentle disposition, and easily tamed, when they may be taught a number of amusing tricks. They are frequently brought to Europe, not only for exhibition in menageries, but also to be carried about by itinerant musicians, who teach them to perform a variety of evolutions, such as sitting on a saddle-gown and sweeping up the platform on which they are exhibited with a miniature broom. Their intelligence is very considerable. Perhaps the most remarkable instance is the following, quoted by Darwin in his "Descent of Man": Rengger had been in the habit of giving his specimens small quantities of sugar twisted up in paper. One day he noticed living wasps in the paper, and the unfortunate monkeys, on seeing their prizes and the wasps were severely stung. But this was never afterwards the case for he always was, by experience, to always first hold the paper to their ears to detect any noise it might give.

The names given to the genus *Cebus* are a little confusing. Buffon, compelling the native names *Caligazon* (the Cebus meaning great monkey and monkey) to bow to the usage of the French language, divided the *Caligazon* into *Sapajus* and *Sapajus*, the last representing the genus *Cebus*. To make confusion worse confounded, the names *Sapajus* and *Sapajus* are sometimes used synonymously. The name *Cebus* seems preferable to the alternative names, as it is at once barbarous and devoid of meaning. It is given to the monkeys of the genus *Cebus* because of their naked appearance, and long hair is restricted to a narrow band on the head as to resemble the crown of a capuchin monk. The species are rather numerous, but are all restricted to tropical South America.

The *Cebus* (*Cebus patulus*) is a native of Guiana and Brazil. In the monkey the hair of the head is bristly black, and the body is covered with black tufts, which give the monkey the appearance of being furnished with horns; hence the name of horned monkey, which is sometimes bestowed. It is a creature as destitute of wit, with the chest and belly spotted, and the hands and tail brown. Dr. Romanes, writing to subject an intelligent monkey to close observation for some length of time, obtained the loan of a brown capuchin from the London

Zoological Gardens. A diary was kept, in which were noted all the incidents in this monkey's life from 18th December, 1880, to 22nd February, 1881. Dr. Romanes has now published this diary and the result of his observations in his interesting work, "Animal Intelligence."

CAPUCHINS, or CAPUCHIN FRIARS, a branch of the monastic order of Franciscans, who covered their heads with a *cappuccio*, or hood. They were erected into a separate branch of the order by Pope Clement VII. in 1528, and have always been famous as missionaries.

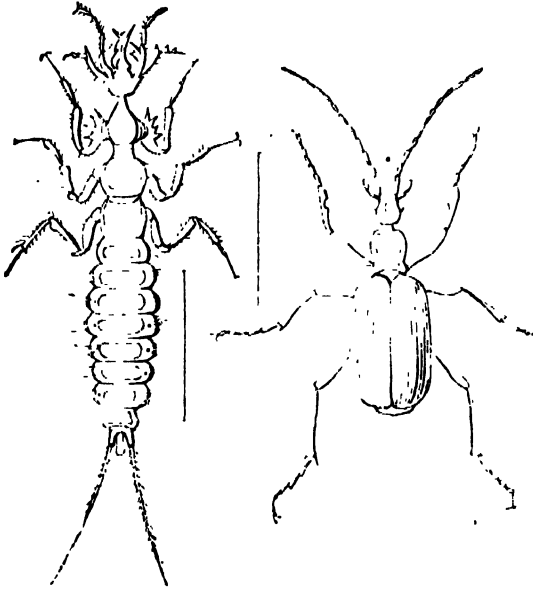
CAPULETS and **MONTAGUES** (*Capelletti* and *Montecchi*), two noble families of Verona, whose deadly feuds have given us the exquisite play of Shakspeare, "Romeo and Juliet." The Veronese fix the date of Juliet's death as 1303, and show a rude sarcophagus in red Verona marble, situated in the suppressed Franciscan monastery, as her tomb. If "Escalus, Prince of Verona," be really Bartolommeo della Scala, he died in 1303, and so far is in favour of the date of the tradition. In the "Purgatorio" (vi.), Dante, upbraiding the Emperor Albert for not assuming his traditional lordship over Italy, torn by distracted factions, alludes by name to the feuds of the Capulets and Montagues:—

"Come and behold! Montecchi and Capelletti,
Monaldi and Fillippeschi, reckless man!"

The emperor was murdered in 1308, and Dante probably wrote a year or two before that only. The house of the Capulets, with the hat (*capella*) carved in stone over the inner arch of the gateway, is still to be seen at Verona, used as a stable yard. That some such tragic result would accrue from the vendetta-like hate of the two families as that which forms the subject of Shakspeare's play is only too probable; and the popular tradition of Romeo and Juliet was the subject of one of Bandello's famous tales (1551).

CAPYBARA (*Hydrochirus capybara*), or Water Hog, is an animal belonging to the order RODENTIA, and nearly allied to the AGOUTI and CAVY. The capybara is confined entirely to the New World, and found throughout South America in the neighbourhood of the great rivers in Brazil, Guiana, and Paraguay. It is the largest species of rodent now existing, the body attaining sometimes a length of 4 feet. There are two incisor teeth in each jaw. The molar teeth, four on each side of each jaw, are made up of numerous transverse plates, which are so disposed in the posterior teeth that Cuvier was led to indicate an affinity on the part of this animal with the elephant—a view which enjoys the sanction of the best comparative anatomists. The head of the capybara is long, thick, and drawn out towards the snout; the eyes are large, and the ears rounded and moderate. The feet are webbed, the digits being armed with broad, blunt, hoof-like claws. The body greatly resembles that of a pig, being covered with long coarse bristly hairs. In colour it is reddish-brown above, yellowish below. There is no trace of a tail. The capybara lives upon herbs and fruits; it is a nocturnal animal, swimming across rivers and torrents in search of food, and raising a horrible clamour. They wander in infinite congregations about the banks of the rivers, and as they are slow of foot they save themselves from the hunters by swimming, but notwithstanding large numbers are killed. Pennant, who quotes Muratori, says that it runs slowly, swims and dives remarkably well, and keeps for a long time under water; feeds on fruits and vegetables, is very dexterous in catching fish, which it brings on shore and eats at its ease, sits up, and holds its prey with its fore feet, feeding like an ape, takes its food in the night, and commits great ravages in gardens; keeps in large herds, and makes a horrible noise like the braying of an ass. Judging from the structure of its teeth and digestive organs, the alleged fact of its feeding on fish seems very doubtful. The flesh is eaten by the Indians, and constitutes the ordinary food of the jaguar.

CARABIDÆ is a family of Beetles belonging to the section PENTAMERA. The members of this family are generally very abundant in gardens and fields, running among grass or concealed under clods of earth or small stones. Some, such as the brilliant *Pœcilus* and *Amara*, run actively about in the sunshine, and are called Sun-shiners from this habit. Generally, however, it is at night



Larva.

Galbata lecontei.

that they are on the alert. They are a very useful group of beetles, helping to keep down many noxious larvae of other insects, which, but for the Carabidæ, might extend to an alarming degree. In this country, at least in its southern parts, a tree-frequenting species is found, *Calosoma inquisitor*. On the continent of Europe a large, brilliant, metallic-tinted species of the same genus, *Calosoma sycophanta*, is not uncommon. This fine beetle passes its life on trees, feeding chiefly on caterpillars. The ravages committed by some of the caterpillars of the family Bombycidae are in many places much restrained by the Calosoma, which deposits its eggs in the nests of the moths, so that the voracious Carabidæ from their infancy begin to reduce the numbers of the noxious moths.

It has been noticed in France that in those parts where the *Carabus auratus* is abundant the cockchafer is almost unknown. The cockchafer is a very destructive insect, especially where it abounds, as the grub feeds on the roots of grass, continuing in that state for some years. This fine Carabus seizes the chafer before it has deposited its eggs, and it is said to be fonder of the egg than any other part of the insect.

Some of the Carabidæ are vegetarians, and a species of the genus *Zabrus*, found in France and Germany, and less commonly in England, proves very destructive to the wheat. The Carabidæ possess a special weapon of defence against their enemies in the acrid or fetid liquid, which they secrete by means of special glands from the anus. In some species, such as our Common BOMBARDIER BEETLE, the liquid is expelled with considerable force, causing a slight explosion, which is always visible and in some cases distinctly audible.

The Carabidæ form a very numerous family, embracing not less than 10,000 species. They are world-wide in their

distribution. "They appear to occur," says Bates, "everywhere on the land-surface of the earth where life exists at all—in the most desolate places of the tropics, in the Arctic regions, up to the line of perpetual snow on mountains, and in the deepest recesses of limestone caverns (Anophthalmi and others), where, for countless generations deprived of the merest glimmer of daylight, a numerous tribe are found completely blind, and with all traces of eyes obliterated. They are well represented on the remotest oceanic islands, generally in species and genera curiously modified from all known forms of the nearest continents."

The Carabidæ closely resemble the TIGER BEETLES (Cicindelidæ) in their structural characters. The antennæ are thread like. There are two palpi to each maxilla. In some genera, as *Elaphrus* (fig. 24, Plate BEETLES), the eyes are prominent. In the genus *Anthia* (fig. 25) the wings are rudimentary or absent. As a specimen of the family the larva and perfect insect of *Galbata lecontei* is figured. The perfect insect is a long-legged blackish-black beetle, with somewhat truncated elytra, black head, brownish-red narrow thorax, and reddish legs. The grub is considerably magnified, and must be a very formidable fellow to any poor insect getting into its arms or jaws. It has five eyes grouped behind the antennæ. Its maxillary palpi are spined. The fore legs have four spines on each shoulder. Its pupa has a pale, bright, testaceous, depressed body, with two sets of fleshy tufts on each side of the segment behind the head. The larva constructs a feeble cocoon with thread and earth, in which to undergo its transformations.

CARACAL (*Felis caracal*) is a species of lynx belonging to the family FELIDÆ, of the order CARNIVORA. It has a wide geographical range, extending not only over Africa, but over Southern Asia as far eastward as the Ganges. The caracal is the lynx of the ancients, that is to say, of Aristotle, Ollian, and Oppian, for Virgil and the other Latin poets seem to have had no very precise idea of the animal whose characteristic was accorded to Boeotus as one of his attributes. In length the caracal is about 34 inches, excluding the tail, which measures 9 or 10 inches. The average height is 14 inches. In colour it is a uniform reddish-brown, growing paler from above downwards, and becoming white immediately underneath the throat, neck, and belly. Above the eyes are two spots of pure white, one being situated above and on the inner side of the eye, the other at its external

Caracal (*Felis caracal*).

angle. The ears are comparatively long, tapering gradually to a fine tip, surmounted by a pencil of long black hairs, which are dark externally, and whitish within. Like other species of lynx, the caracal is a good climber, and feeds chiefly on small mammalia and birds. It has obtained the name of "lion's provider," most probably from its dogging the footsteps of the lion, and having been found preying

the margins of lakes and swamps in search of small fish. In its general habits it resembles the caracaras. Another species with similar habits is the *Chimachima* (*Mileago chimachima*).

CARACAS, the capital of the Republic of Venezuela, in South America, in the province of Caracas, is about 16 miles from its port, La Guayra. The town is situated on a declivity, is regularly built, and has wide streets crossing each other at right angles. On the south side of the town is the small river Guayra, which receives several streams rising from the heights on which the town stands, and which supply it abundantly with water. In the Plaza Mayor, or principal square, which is 2880 feet above the sea, the market for vegetables, fruit, meat, salted provisions, fish, poultry, game, bread, parrots, monkeys, birds, &c., is held. Towards its eastern extremity, but within the square, is the cathedral, an extensive and solid edifice, which withstood the earthquake of 1812, but was materially damaged by that of 1826. In it is the tomb of Bolivar. The town is the seat of an archbishop and of the legislature and government of the republic. It has a university, founded in 1778, several parish churches, monasteries, nunneries, a municipal hall, and a population of 50,000, who carry on a considerable trade in the produce of the neighbouring valleys, which are very fertile, yielding large quantities of indigo, coffee, and the best cocoa in the world. The city is finely situated, and in the enjoyment of a temperate and healthy though variable climate; but it is exposed to the attacks of earthquakes. By the terrible earthquake of 1812, 12,000 persons are said to have perished amidst the ruins of their houses. The exports from La Guayra consist principally of cocoa, cotton, indigo, coffee, tobacco, hides, and live cattle. The city of Caracas was founded by Diego Losada in 1567, and under the Spanish government was the seat of the captain-general of Venezuela.

CARAC'TACUS (Caradoc) was the bravest of all the British chiefs who opposed the Romans. Car Caradoc, in Shropshire (Caradoc's camp), still exists to show the victim with which he used such small means as he had. He fought for about eight years, but in 541 was finally defeated, captured, and taken to Rome. Caradoc was king of the Silures or South Welsh (see Map BRITANNIA ANTIQVA prefixed to this volume), and after his defeat fled from the reign of Claudius to the Queen of the Brigantes (Northumbria), who, however, gave him up. The Emperor Claudius was a kindly old man, and the noble character of the rude British chief so moved him that he adopted the unusual course of sending Caradoc back to his native land, there to rule over some part. A speech of Caradoc of some subtlety is authentic; as he passed in chains along the Roman Sacra Via in the triumph of his conqueror, he was heard to wonder that men who possessed such grandeur and such wealth should cross land and sea to capture his poor cottage in Britain.

CAR'ADOC SANDSTONE. See CARADOC.

CARAGEEN'IN, a gelatinous substance obtained from one of the algae known as Irish moss (*Chondrus crispus*), which contains nearly 80 per cent. of this principle. It is insoluble in cold water, but soluble in boiling, the solution cooling to a strong jelly. It is much used in medicine and as a dietetic article in jellies and puddings, and also as a cattle food. It has been recently employed for the imitation of morocco leather, by incorporating it with leather scraps, both dried and ground. The material is called velo-plastic, and it has great gelatinizing power. See GELATIN.

CARAM'OLA. See AVERROHA.

CAR'AMEL, a dark brown-coloured substance obtained by heating sugar in a metal pan to a temperature not exceeding 220° C. (428° Fahr.) It has a rich sepia tint, is soluble in water, and much used in commerce as a

colouring material for wines, beer, &c. It gives the dark colour to porter and stout, but in this case it is produced by roasting the malt. The formula is $C_{12}H_{18}O_9$.

CARA'PA is a genus of plants belonging to the order MELIACEÆ. There are six species, natives of the tropics. They are trees with pinnate leaves and inconspicuous flowers. There are four or five petals, contorted in bud. The stamens have their filaments united into a tube toothed at the top, the anthers sessile between the teeth, and included in the tube. The ovary, surrounded by a thick short disc, is four to five celled, with four to six ovules in each cell; the style short. The capsule is loculicidal; the seeds thick, exalbuminous. *Carapa guianensis* grows in the forests of tropical S. America. The bark possesses febrifugal properties. The oil obtained from the seeds is called Carap Oil, and is used for burning. The wood Crab Wood is useful for the masts of ships; and also for furniture, as it is light and takes a good polish.

CAR'APACE is the name applied to the shield protecting the upper part of the body, possessed by the CRUSTACEA (crab, lobster) and the CHITONIA (chiton, turtle). The name is also given to the membranous sac which incloses the body found in some INSECTARIA and RHIZOPODA.

CAR'AT or **KAR'AT.** The karatium (*karation*?) was originally the twenty-fourth part of the *maire* or half-pound among the French, from whom the word came; so that three of these carats made an ounce. It was afterwards the name given to a small weight used for gold and jewels, which varied greatly in different countries. At last, however, it went out of use, except only in the sense in which it still exists, namely, that a carat means the twenty-fourth part of any weight of gold or gold alloy. If such a weight be all gold, it is said to be twenty-four carats fine; if one-third only be gold, it is said to be eight carats fine.

CARAU'ETIUS, Emperor of Rome, was a Mexican. Gaul, and rose from the rands to the command of the fleet off the coasts of Britain, which, during the reign of Maximian, had the duty of opposing the incursions of the Picts and Scottians. He was suspected of treachery, and ordered that his execution was ordered. He at once fled to Britain and raised the standard of revolt, proclaimed himself emperor, A.D. 287. Diocletian and Maximian, his liege lords, in person, finally sent to recover Carausius, and he became the emperor. But his reign in Britain, one of the most perfect and most successful periods of the history of the empire, was founded. He successfully defended his territory beyond the shores, except in the north, where, at what is now Boulogne, his old naval station. He counted the Franks, and engaged them as mercenaries, and once fairly kept at bay the Caledonians of the north. His power on the northern and western seas of Europe was absolute, a prediction of Britain's future naval empire. The Emperor Constantine under some pretext went to war against Carausius, and deprived him of his territories and possessions. Carausius was preparing to retaliate when he was murdered by his chief general Allectus, A.D. 293, having reigned with brilliant success for nearly seven years.

CARAVAGGIO, MICHELANGELO AMERIGHI DA, a celebrated painter, was born at Caravaggio, in Lombardy, about the year 1569. Caravaggio acquired his first love of art, together with such knowledge as he could pick up, in the service of certain artists at Milan as a school-teacher. He afterwards went to Venice, where he studied the works of Giorgione, and thence to Rome, where he made a resolution to study no more from artificial models, but to adhere simply to nature as he found it in the Eternal City. The manner he assumed was characteristic of dark and gloomy shades, illumined by a scanty twilight; but it had a powerful influence over contemporary art, and he became the head of a naturalistic school of painters. Having quarrelled with and killed one of his companions, he fled

first to Naples and then to Malta. Here he became engaged in another quarrel, and was thrown into prison, but escaped to Sicily, where he was attacked by armed men sent in pursuit of him, and was grievously wounded and disfigured. In the meantime a pardon had been obtained for him at Rome, whither he returned; but on landing, being arrested by mistake, the excitement, added to the fear of the loss of his property which he had left on board the vessel, brought on a violent fever, and on reaching the Porto Ereole he expired. He was then forty years of age. His principal works are a "St. Sebastian," in the Capitol at Rome, a "Supper at Emmaus," in the Borghese Palace, the "Card players" in the Sciarra Palace, and the famous "Entombment of Christ," admittedly his masterpiece, now in the Vatican. Ribera and Salvator Rosa both owe much to Caravaggio.

CARAVAN, a travelling body of merchants or pilgrims who join company for safety and convenience. The term, which is of Persian origin, is confined to journeys across the deserts of Asia and Africa, and wherever on these

continents the roads are insecure, and travelling is, from any reason, dangerous, the practice obtains of forming caravans. In the East they have a commercial or a religious character, and very frequently both; the greatest of them all, those which proceed annually to the holy city of Mecca, have always trade as well as prayers in view.

Besides these large annual caravans, others on a smaller scale are constantly being formed in the East by merchants and travellers going the same road. They generally appoint one of their voluntary association to regulate the order of march, and the distance traversed each day is usually between 20 and 30 miles. The great trade between China and Russia is carried on almost entirely by caravans. The road runs from Pekin to Kiachta, the great border market for the barter of Chinese and European articles, and the journey occupies from seventy to ninety days.

CARAVAN'SERAI, a public building or inn appropriated for the reception and lodgment of the caravans. They serve in lieu of inns, but there is the difference that travellers must bring all their provisions and necessities



The Caravanserai of Forty Pillars.

with them. They are chiefly built in dry, barren, desert places, and are sometimes furnished with water brought from a distance at great expense. Caravanserais are also numerous in cities, where they serve not only as inns, but as shops, warehouses, and even exchanges.

The most wonderful caravanserai in the world is in a narrow pass of the Belur-tag, near the desert of Gobi, which it is believed has been used since the fourth century B.C. It is called the Stone Tower, and is one of nature's creations, which man has modified for his own convenience. It is a massive rock—the face of a mountain which forms one side of the defile, hewn into a regular form, with two rows, each of twenty columns, now in a ruinous condition. Hence its modern name of Chihil-Suton, or the Forty Pillars. It is venerated by the natives far and wide, who ascribe it to supernatural agents. But by the traders who rendezvous at the station it is styled Takhti-Suleiman (the throne of Solomon).

CARAWAYS, the ripe fruit of *Carum Carui*. The seeds, as they are vulgarly called, which are the furrowed halves of the ripe fruit, have a peculiar aromatic flavour, and are used as an agreeable carminative by confectioners; the roots themselves are eaten in the north of Europe,

Caraways are used in medicine as a carminative. The Caraway plant belongs to the order *UMBELLIFERÆ*. It has a branched stem 1 or 2 feet high, with a carrot-shaped root and finely-divided compound leaves. The calyx is inconspicuous, the petals obovate with a narrow point bent inwards. The carpels have five filiform ridges, the umbels are compound, there is no partial involucre, and if the general involucre is present, it consists of only one leaf. It grows in mid and south Europe and in parts of Asia, and is cultivated both on the Continent and in England.

CARBAZOTIC ACID. See *PICRIC ACID*.

CAR'BERRY or **CAR'BURY**, a small place of much interest in ancient Irish history, in the county of Kildare, Ireland, situated near the source of the Boyne, 5 miles from Enfield. Near it is Carberry Castle, erected in the twelfth century. This passed into the hands of the Cowley family in 1548, who assumed the name of Wellesley on succeeding to some property through marriage connections in 1728. The Duke of Wellington was descended from this family.

CAR'BINE or **CAR'ABINE**, a fire-arm made with a butt to be fired from the shoulder, but having a much shorter barrel than the ordinary musket or rifle. It came into use during the sixteenth century as a weapon for cavalry. The

word comes from the Old French *calabrien*, or soldier firing a *calabre*, one of the ancient war-engines. Modern carbines are rifled, and are breechloaders. They are carried by the cavalry of the British army (with the exception of the Lancers), by the artillery, the yeomanry cavalry, by the volunteer artillery, and by the Irish constabulary. The patterns at present in use are the Martini-Henry and the Snider-Enfield, the weapons taking the same ammunition as the long rifles.

CARBINEERS' or CARABINEERS'. A corps of light cavalry under this name was raised in France in 1660, its principal weapon being a short arquebus. The name afterwards came into general use to designate regular cavalry, and some regiments of infantry were also termed carbineers. In the British army the name is still retained as a regimental title by the 6th Dragoon Guards.

CARBOLIC ACID. See PHENOL.

CARBON, a non-metallic elementary solid body, which is widely diffused throughout nature. The purest and at the same time the rarest form in which it occurs is that of the **DIAMOND**; the more common states in which it is met are those of anthracite, graphite or plumbago, and coal; but in these cases it is not free from admixture. Another well-known form of carbon, but still impure, is charcoal. Under **ANTHRACITE**, **COAL**, and **PLUMBAGO** various properties of carbon are described. Carbon is the chief element in three groups of substances—the mineral forms, such as diamond, anthracite, &c.; the carbonates; and the vegetable series, as coal, asphaltum, peat, and the different varieties of charcoal.

Charcoal consists mainly of carbon procured from the decomposition of wood or peat by burning incompletely or carbonizing. This operation is conducted in pits made in the ground, or in heaps carefully covered over to prevent access of air. For the purer kinds of charcoal the operation is effected in iron cylinders. Wood is essentially composed of carbon, oxygen, and hydrogen. By the action of the heat it is decomposed, the oxygen and hydrogen are expelled, and uniting in certain proportions form water; and combining also with part of the carbon various gaseous and other compounds are formed. Among the latter are acetic acid, sometimes called pyroligneous acid, and a peculiar inflammable fluid known by the name of pyroxylic spirit, methylic alcohol, or wood naphtha, and tar.

Charcoal has the following properties:—It is black and in some of its forms lighter than water, and full of pores, occasioned by the expulsion of the bodies volatilized. Charcoal, from whatever source procured, is absolutely infusible by any degree of heat, however great; neither that of a powerfully condensing mirror, the oxyhydrogen blow-pipe, nor the voltaic discharge being sufficient to produce perfect fusion. In its common state it is one of the worst conductors of heat known, but its power is increased after being strongly heated. It is the most perfect solid non-conductor of heat known, and has a large application under the name of carbon cement for packing refrigerators and for covering boilers to prevent radiation of heat. Charcoal is a moderate conductor of electricity, which is so far from being the case with the diamond that it may be rendered electrical by friction.

Charcoal is tasteless, inodorous, and insoluble in water. It possesses the property of destroying colouring matter, especially the charcoal procured by charring bones, which is usually called *animal charcoal*. It is largely used for this purpose in sugar refining, also for decolorizing glucose and molasses. It has an extraordinary power of condensing gases: graphite, on account of its compactness, does not possess this quality. Wood charcoal will absorb ninety times its volume of ammonia gas. It is also a valuable substance for absorbing putrid or decomposing matter and effluvia of all kinds, and is used for this purpose in the carbon closet for the sick room. It removes the

organic matter from water. A pocket carbon-filter is now considered a necessary part of a soldier's outfit in hot countries where foul water is met with. Charcoal is highly combustible; it burns in the air when strongly heated, though not very rapidly. During this combustion carbonic acid is formed by the union of the oxygen of the air with carbon.

It has been mentioned that charcoal is not pure carbon, and when a quantity is burned there always remains a portion of ashes containing a considerable quantity of carbonate of potash and some other alkaline and earthy salts, which have been taken up from the soil in which the tree grew that furnished the charcoal.

Charcoal is used not merely for combustion, but also for the important purpose of making gunpowder.

Carbon, in an impure state, or charcoal, is employed medicinally both internally and externally. Its power of absorbing gases and moisture renders it useful in some cases, while in other cases it seems to act by some power exerted on the vital energies of the system. It is also used in cataplasms for absorbing fetid matter. Charcoal, especially animal charcoal, possesses the power of destroying the colour, smell, and taste of a great variety of vegetable and animal substances, particularly of mucilages and oils, and of matters in which *extractive* abounds. Meat and ganne, too far decomposed, may be restored to a condition fit for use by the employment of finely-powdered charcoal. Charcoal, both from its antiseptic and vital properties, is useful in many forms of fever, especially the bilious, remittent, and intermittent fevers of warm climates, given during the interval of the vomiting of the black matter; and in yellow and typhoid fevers. It is also serviceable in dyspepsia accompanied with fetid breath and eructations. It is sometimes of service in constipation, dysentery, as an application to foul ulcers, and as a styptic. Blacklead, coke obtained in the manufacture of gas, and soot or lamp-black are other forms of carbon. Carbon is also used in blacking, in printers' ink, in black varnishes, and in making crucibles. The atomic weight of carbon is 12; symbol, C.

CARBONARI (literally, the charcoal-burners), the name of certain secret political associations, which first assumed historic importance about the commencement of the present century. Like the Freemasons the Carbonari professed to have the history of their societies from a period of remote antiquity, but their claims in this respect appear to be of a shadowy character, and they seem to have been first established in Italy during the French *régime* in Naples. At that period many of the republicans who were dissatisfied with the government sought refuge in the mountain regions of the Abruzzi, where they formed themselves into a secret society, taking their name from the vocation extensively practised there of charcoal burning. They also adopted many of the terms used in this trade to describe their meetings, &c. Thus a lodge of Carbonari was called a *baracca* or hut, its surroundings being called "the forest," an ordinary meeting being termed *rendita*, "a sale," and a special meeting *alta rendita*. The members spoke of one another as "bons cousins," the uninitiated being termed *pagani*, and a union of a number of lodges was a *republic*. The first aim of these societies appears to have been the overthrow of the French government, and under their leader, Capobianco, they engaged in irregular warfare against the troops of Murat, and though at first defeated they reappeared and assisted in the final overthrow of the French authority. Ferdinand, however, on his return to power, refused to grant the constitution he had promised them, and the societies accordingly turned against him, and they were the prime movers in the Neapolitan insurrection of 1820. They also rose the same year in the Papal States at Macerata and Faenza, but here they were unsuccessful, and their leaders fell into the hands of

the authorities. They were the authors of the Piedmontese revolution of 1821; and being regarded as the leaders of the national cause their numbers increased until, it is said, they included nearly 700,000 among the initiated—soldiers, priests, and students being among those enrolled. In Lombardy and Venetia the lodges directed their action against the rule of Austria, but their efforts were paralyzed by the capture of Silvio Pellico, Torelli, and others, and the order received a check from which it never fully recovered.

Carbonarism was introduced into France about 1820, where it soon became firmly established, the societies being organized and united more completely by far than they had ever been in Italy. The headquarters of the society were established at Paris, Lafayette being chosen president. They attempted to rise at Belfort in 1821, but the insurrection was quickly suppressed. Ten years later the influence of the Carbonari had greatly declined, its place having been taken in Italy by the society calling itself the party of Young Italy, and in France by the new *Charbonnerie Démocratique*, which aimed at the establishment of a republican form of government. Other societies were formed from its members, but as a distinct organization it appeared to have ceased to exist.

Unlike the more modern secret societies of Socialists, Anarchists, and Nihilists, among which atheism is a first principle, the Carbonari professed adhesion to the Christian religion, though opposed to the Papal power; and one of its statutes declared that "every Carbonaro has the natural and unalterable right of worshipping God according to his own convictions." They regarded the crucifixion of Christ as one of the worst examples of tyranny, and a symbolical crucifixion formed one of the ceremonies observed in conferring the degree of "Grand Master Grand Elect." Many elaborate symbols were used in the ceremonies of initiation, the members all being bound to secrecy and obedience, under the penalty of death. Some of the catechisms, statutes, and rituals have been printed, and have, through this means, become public property, but much of the work of the society was carried on without even the use of writing, and a complete history of the organization has yet to be written. The French Emperor Napoleon III. was in his youthful days a member of this society, and by some this fact has been assigned as one of the causes that led to the Franco-Sardinian war against Austria.

CARBONAS are irregular lenticular masses of ore found in the vicinity of some tin lodes in the western districts of Cornwall; they generally dip at a much less angle than the main lode, and are usually very rich.

CARBONATE, a salt composed of carbonic acid and a base. The chief varieties are described under their alkaline, earthy, and metallic bases. Many of the carbonates are found naturally, and form important minerals. The carbonates of the alkalis are soluble in water. Nearly all others are insoluble in water, but slightly soluble when it contains carbonic acid. They are generally decomposed by heat, and by all acids, with evolution of carbonic acid.

CARBONIC ACID. There are two compounds of carbon and oxygen, *carbonic oxide* (CO) and *carbonic acid* (CO₂). Carbonic acid was known to Paracelsus and Van Helmont, who called it "gas sylvestre;" Hales thought it was deteriorated air; Black called it "fixed air;" Bergmann, "marial acid;" but it was left to Lavoisier to discover its true character.

Carbonic acid exists largely in nature. It is found in comparatively small quantity in the gaseous state in the atmosphere, generally about 4 parts by volume in 10,000; it is found in solution in spring water and sea water, and in some mineral waters to a sufficient extent to render them effervescent; but it is in solid combination that it is found in the largest quantity, forming nearly 41 per cent. of all limestones and marbles, besides occurring in less quantity united with other earths and metallic oxides.

Carbon and oxygen do not appear to combine, or, if at all, very slowly at common temperatures, by direct action; but certain compounds which contain carbon, when undergoing the process of fermentation, yield a large quantity of carbonic acid. [See FERMENTATION.] It is also produced during the process of respiration, by animal and vegetable putrefaction, and by combustion, whether of oil, wax, tallow, vegetable matter, or coal. It is usually prepared by acting on marble or limestone by hydrochloric or sulphuric acid. In its uncombined state carbonic acid is usually a gas, of which 100 cubic inches weigh 47·8 grains. Its specific gravity is 1·524, or rather more than half as heavy again as air.

Carbonic acid gas is colourless and transparent, and therefore invisible; it has an acid but slightly astringent taste; it reddens litmus paper, when moist, of a characteristic port-wine colour, but the blue colour returns as the acid volatilizes. It extinguishes burning bodies, and is fatal to animals. On account of its great density it diffuses slowly in the air, and hence it is apt to remain long in fermenting vats, old wells, &c., and has frequently produced fatal effects upon persons descending into them. Atmospheric air may, however, contain one-twentieth of its volume of this gas, and be respired without becoming hurtful. On account of its great weight it may be poured from vessel to vessel, as is shown by its extinguishing a taper repeatedly. Though gaseous at common temperatures, Faraday showed that carbonic acid could be brought to the liquid state by intense cold and pressure. It requires a pressure of 36 atmospheres at the freezing-point of water; it is then a limpid colourless fluid, which M. Thilorier first rendered solid. Carbonic acid, as it is found in effervescent mineral waters, is an excellent and refreshing beverage. Liquid carbonic acid has a specific gravity of 0·83 at 0° C. (32° Fahr.) It does not mix with water, but is soluble in alcohol and ether. Solid carbonic acid is a body of remarkable properties; it reduces the temperature of a spirit thermometer to -78° C., and when pressed on the hand raises a blister like a burn. When mixed with ether it becomes the most powerful refrigerator known, from its rapid evaporation. Mercury is instantly solidified by it. Many gases hitherto considered permanent were liquefied by Faraday by the use of this mixture.

Carbonic acid gas acts upon the human system as a powerful sedative poison. Unless largely diluted with atmospheric air it cannot be breathed, as it stimulates the glottis or entrance to the windpipe, to contraction, which causes the person exposed to this gas to die of suffocation. But even when so far diluted as to be able to pass the glottis, and enter the lungs, it acts as a poison; and also when brought in contact with the skin (pure atmospheric air being breathed at the same time), or with the mucous membrane of the stomach. A variable quantity of carbonic acid gas exists at all times in the air, as essential to the respiration and the life of plants; but any considerable increase of this quantity is deleterious, and destructive to the life both of animals and vegetables, though plants will flourish in an atmosphere containing 9 or 10 per cent. of carbonic acid gas, provided they are exposed to the direct solar light, for this quantity is poisonous to them in the shade (Saussure). The cause of the absence of vegetation in the celebrated Poison Valley of Java is the existence of a subterranean source of carbonic acid gas, and not the shade of the upas-tree, as is popularly believed.

Carbonic acid gas is evolved from the combustion of fuel, and during the process of fermentation; and it is often formed and accumulated in mines, particularly coal-mines, where it is termed *choke-damp*, and in old draw-wells. It is also formed or extricated by the respiration of animals, and becomes the source of disease and death when many human beings are crowded together in close ill-ventilated rooms. Hence the necessity of ventilation.

When, from breathing carbonic acid, an individual has fallen into a state of stupor or insensibility, he must be removed as speedily as possible into the pure fresh air; cold water should be dashed upon the face, ammonia may be rubbed upon the chest, and artificial respiration must be at once resorted to, and efforts to effect this must be persevered in for several hours. Carbonic acid gas has also been employed medicinally, but it is not a remedy of much power. It has also been proposed as an anæsthetic, but its use is too dangerous.

CARBONIC OXIDE or PROTOXIDE OF CARBON (CO) is known only in the gaseous state. It may be readily prepared in many different ways. It is always produced in fires of coal or charcoal where there is an insufficient supply of oxygen to convert the gases into carbonic acid, and it may be recognized by its blue flame. It is colourless and insipid, and but slightly soluble in water; it is fatal to animals, and extinguishes a taper if immersed in it; but when it meets with oxygen gas it burns, and is converted, by combining with it, into carbonic acid. It has no action upon blue vegetable colours; and, unlike carbonic acid, it does not occasion any precipitation in lime-water. Its specific gravity is 0.9679, and 100 cubic inches weigh 30.1 grains. It forms an explosive mixture with oxygen, and it is usually prepared pure in the laboratory by heating ferrocyanide of potassium with sulphuric acid. It plays an important part in the blast furnace, reducing the oxides of iron, and it can be absorbed and removed from a gaseous mixture by cuprous chloride. It is decomposed by heating with potassium hydrate, forming potassium formate.

CARBONIFEROUS PERIOD. This is the most important period in the newer PALÆOZOIC EPOCH, because of the industrial applications of its deposits. It has received its name from the abundance of carbon stored up in it, either as carbonic acid in carbonates, or as hydrocarbons and carbon in the coal measures, from which we derive our supplies of coal. In the rocks of carboniferous age we find the oldest and most important coal deposits known; and although coal [see BROWN COAL] occurs in strata of every geological age since, yet in this period about nine-tenths of all the workable coal on the earth is to be found. To the remarkable development of these deposits in Great Britain, England owes much of her material greatness; for from them are procured an abundant supply not only of fuel, but also of the most important metal—iron; and the occurrence of these two together, and their juxtaposition to limestone, which is used as a flux, render the smelting of the iron comparatively inexpensive.

The rocks of this period are of a very varied and often local character—marine, fresh-water, and terrestrial deposits all having their representatives, sometimes interstratified. It was a time, on the whole, of gradual and continuous subsidence, as we find the newer deposits successively overlapping the older, till in some cases the uppermost beds rest directly on Silurian, Cambrian, or even granitic rocks, the earlier strata being completely hidden.

It has been found convenient to separate the strata into three chief subdivisions, which, where typically developed, represent successively oceanic, littoral, and lacustrine or terrestrial conditions.

The Carboniferous Limestone formation is chiefly of marine origin; it succeeds the DEVONIAN and Old Red Sandstone, and its basal beds, which are often sandstones and shales, form, in some places, a continuous and conformable series of strata connecting the two periods. This formation is most typically developed in the centre of the British area, but is greatly modified to the south and north.

The Millstone Grit is of more local occurrence, and is generally not so largely developed. With it may be included the underlying Yoredale rocks of Yorkshire. These beds are mostly of littoral origin.

The Coal Measures may be regarded as of terrestrial origin, although they also contain fresh-water, estuarine, and even some marine beds; they are the most important group of strata in the whole geological series, and are considered separately. See COAL.

The carboniferous rocks of Scotland differ materially from those of England, but equivalent beds can be recognized:—

General Section in England.	In Scotland.
Upper Coal Measures,	Upper Red Sandstone.
Middle Coal Measures,	Flat coal group.
Lower Coal Measures,	Slaty blackband ironstone.
Millstone grit,	Moonstone rock.
Yoredale beds,	{ Garnkirk limestone and lower coal and ironstone series.
Carboniferous limestone,	Roman Camp limestone.
Lower carboniferous slates and grits,	{ Calcareous sandstone.

In several places through the carboniferous rocks sheets of interstratified lavas occur, attesting the presence of active volcanoes during this period; they were, however, probably only the remnants of the great volcanic outburst of Devonian times. The structure of Burntisland shows it to be an old choked volcanic vent, and Arthur's Seat is the remnant of a small carboniferous volcano. During the deposition of the coal measures this activity had greatly abated, but the frequent oscillation of the land shows that the forces are still at work below.

Under such varying conditions, and in such a diversity of strata, it is not surprising that the fauna and flora should be abundant and peculiar; we find the Palæozoic types becoming modified and approaching more nearly to the Mesozoic.

Corals are very numerous, and Crinoids are also well represented; Trilobites and Eurypterids are greatly reduced, being supplanted by Limuloids and Macrourians; Brachiopods are very abundant, but are exceeded, both generically and specifically, by the Lamellibranchiates; Cephalopods still have their representative; Orthoceratites, Goniatites, Nautili, and Gasteropods are also represented, and both land and fresh-water shells occur in the coal, where also insect remains are found. Among vertebrates fishes still abound; but during this period the Amphibians were introduced, several species of Labyrinthodonts having been described—one, the Eosaurus, is supposed by some to have been a true reptile.

The flora is large, but mostly of the Cryptogamia, many of them peculiar, comprising Tree-ferns, Calamites, Lepidodendra, and Sigillaria. Conifers are represented by stems and the fruit *Thinnocarpum*.

For such a peculiar formation, it is interesting to note what we may infer from the organic remains as to the conditions of existence. The flora indicates a warm climate, which Sir Joseph Hooker considers was moist and equable. It is also supposed by some authorities to indicate a highly carbonated condition of the atmosphere.

In the British area the land surface appears to have been greatly restricted, and except during the earlier stages of the period, the seas were free from much sediment. Sir A. C. Ramsay thus describes the physical geography of the area:—"The prevalence of corals in the thick masses of carboniferous limestone, and sometimes the rapid thinning out of these masses in opposite directions, point to the conclusion that they were true coral reefs, of the nature of the barrier reefs of Australia and the Pacific Ocean, and that they thinned away on one side to a feather edge in the direction of the land, and on the other more steeply towards the deep sea. These lenticular masses were probably formed round outlying islands, large and small, undergoing a process of slow depression or otherwise on the

shores of some old continent, the details of the original shape of which are now lost to our knowledge. . . . But while in the south coral reefs of the nature of barrier reefs or atolls were being formed; in the north the case was different; for there, as in parts of the modern Pacific, volcanic action was rife, and this is witnessed by the lavas and ashes intermingled and interstratified with the whole of the carboniferous series in Scotland." Towards the close of that time, when oceanic conditions were prevalent, a large part of the sea in the vicinity of the land was very shallow; this became silted up by the deposition of the millstone grit, and was soon after converted into low-lying swampy flats adjoining the sea, and similar in many respects to the everglades of Florida. In such places the forests flourished whose remains are now preserved in our coal measures.

CAR BUNCLE, in mineralogy, has been applied to several gems; thus rubies exceeding 20 carats have been so called, and the Great Mogul is reported to have had 108 of these carbuncles in his throne. The name is now mostly restricted to the dark red garnets (*pyrope*), which are sometimes valuable as gems; a carbuncle pendant to a necklace of Mary Queen of Scots was valued at 500 crowns. When used by jewellers it is cut *en cabochon*, or with a polished convex surface, the back being flat or hollowed out. A deep ruby-like appearance is frequently imparted to this stone by means of a backing of coloured metallic foil. The third stone in the first row of the Jewish high-priest's breastplate was a carbuncle, but to what mineral species it belonged has not been determined.

CAR BUNCLE (Lat. *carbunculus*, a little coal; Ger. *karbunkel*; Fr. *anthrac*), the name given to an inflammatory tumour, nearly allied to a boil, but which is more aggravated and dangerous in all its symptoms. Carbuncles attack both sexes, but occur more than twice as often in men as in women. They are rarely met with under the age of twenty, and though they attack all classes and ranks of society, caputious males of the upper classes, somewhat advanced in life and who have lived freely, are the most liable to these painful afflictions.

They are almost invariably the result of some constitutional disturbance, either a condition of plethora or of general debility. They may appear on any part of the body; but their most common sites are the nape of the neck, the shoulders, or the buttocks.

A carbuncle at the outset generally appears as a hard, red, inflammatory swelling, having an ill-defined boundary, and being attended with a good deal of pain of a burning and throbbing character. This condition may last for a few days, the swelling during this time gradually increasing in extent and hardness, and the skin over it becoming of a dusky red colour. A blister then forms over the most prominent portion, which after a time bursts and discloses numerous small apertures which are filled with a thin discharge. These holes give the sore an appearance which has been compared to that of a sieve or the rose of a watering-pot; but they gradually merge into one large irregular opening, at the bottom of which appears a large gray slough of a slimy appearance. This slowly separates by suppuration, leaving a deep irregular cavity, which requires a long time to heal and fill up. The pain is generally most severe in the earliest stages; it becomes less as the internal slough is exposed, and is generally but slight during the healing process. There is often a good deal of fever and constitutional disturbance during the progress of the complaint. Carbuncles are most dangerous when they occur upon the scalp; but even when they appear on other parts of the body they may cause death from exhaustion or pyæmia.

In the treatment of this affection attention must be paid to the secreting organs, and the patient's strength must be supported by plenty of nourishing food of an easily digest-

ible character. Articles of food like beef-tea, mutton, or chicken broth, milk, eggs, &c., are very suitable in such cases, and there should also be a moderate use of stimulants. The medicines most useful are quinine or bark, and the mineral acids. Sulphide of calcium, of which a tenth of a grain should be taken every two hours, is often of value, as it tends to lessen the inflammation and improve the general health of the patient. The local treatment consists in the application of warm poultices, those of starch, linseed meal, lard, carrot, turnip, and yeast being the most commonly used. An external application of an extract of opium is sometimes used to allay the excessive pain, and it is also given internally for the same purpose or to induce sleep. Free incision is often necessary to prevent excessive loss of tissue, while strapping the swelling tightly round with strips of adhesive plaster during the early stages will often tend to limit the extent of the tumour. Where the latter are used they should be sponged off and renewed daily, the sore being cleansed with warm water at the same time.

CAR BURETS or **CAR BIDES** are compounds of carbon with the metals.

CARCASSONNE, the chief town in the department of Aude, in France, near to the Canal du Sud, stands on the Aude, by which it is intersected; it is 34 miles W. of Narbonne, on the railway from Toulouse to Narbonne. The population in 1883 was 24,500. The town consists of two parts—the old town, situated on a hill on the right bank of the river, and the new town, on a plain on its left bank, the communication between them being maintained by a bridge of twelve arches. The old town is a mass of old houses and fortifications, and may be said to be the solitary remaining specimen in Europe, on a great scale, of the city architecture of the earlier middle ages, especially in its military forms. The ramparts still stand almost exactly as they stood in the thirteenth century. The new town is well built, has broad streets intersecting each other at right angles, a square shaded by magnificent plane-trees, and numerous fountains. There is a fine promenade along the canal. The fortifications by which the new town was formerly surrounded have been demolished to make room for gardens and boulevards. The chief buildings are, the cathedral church of St. Nazaire, which dates from the year 1096, and contains a monument to Simon de Montfort, and is, both in its structure and in its exquisite glass, quite unique among Southern French churches, the new cathedral of St. Michael, the episcopal palace, the hotel of the prefecture, the hotel de ville, the barracks, and the theatre. The halles or covered markets are worth notice. It is the seat of a bishop, has tribunals of primary jurisdiction and commerce, a departmental college, a primary normal school, a diocesan seminary, and a public library. Carcassonne has long been famous for its manufacture of fine woollen cloth, patronized by Colbert: this, however, has much fallen off, though it has still a considerable trade in it. There are also fabrics of stockings, linens, and soap; with paper-works, distilleries, tanneries, and nail-works. Its commerce, which is very considerable, is greatly facilitated by the railway, as well as by the Canal du Midi, a branch of which comes to the town and serves it as a port. The town existed before the invasion of Gaul by Julius Cæsar, who mentions it ("Bel. Gal." iii. 20), by the name of Carcaso, as one of the civitates of Gallia Ulterior. Pliny and Tacitus also mention it. It fell successively into the hands of the Visigoths and Saracens, and suffered much during the wars of the Albigenses. Its last count ceded it to France in 1247. It is said that Simon de Montfort burned 400 of the Albigenses in this town.

CAR'DAMINE, a genus of plants belonging to the order CRUCIFERÆ. The species, which are numerous, are usually smooth herbs, with stalked, entire, lobed, or pinnately cut leaves, and racemes of white or red flowers.

Cardamine pratensis (Cuckoo-flower, Bitter-cress, common Lady-smock) is a plant with large lilac-coloured flowers, and is exceedingly abundant in some parts of the country. It has a bitter taste, hence its name bitter-cress. It is generally in blossom when the cuckoo returns to this country, and at that period (about the time of Lady Day) covers the fields as though linen was bleaching; these circumstances explain its other common English names. Shakespeare says:—

"Lady-smocks, all silver white,
Do paint the meadows with delight."

* It is a native of Europe, Asia, and America, and is found in abundance throughout Great Britain. Four other species of cardamine are natives of Great Britain. The light purple flowers of *Cardamine pratensis* yield a bitter extractive and a volatile oil, which possess slight medicinal properties, and are useful in epilepsy and other spasmodic diseases.

CARDAMOMS are the aromatic fruits of *Elettaria cardamomum*, a species of *AMOMUM*. The genuine officinal or Malabar cardamoms are procured from the *Elettaria cardamomum*. It occurs in the mountainous parts of Malabar and Travancore. The cardamoms of the Wynnad are the most esteemed. When the forests and undergrowth are removed, the plant springs up everywhere spontaneously. It yields fruit at the end of the fourth year, and continues to bear for many years. The ripe capsules are dried slowly over a gentle fire, and then rubbed by the hand from the foot-stalk and calyx. The fixed oil somewhat resembles castor-oil. The excellence of the specimen depends on the volatile oil.

Cardamoms are in great favour in the East as a spice, and also as an aromatic stimulant in the treatment of disease. In Europe they are highly esteemed as carminative and stomachic agents, but they are generally prescribed in conjunction with cordial, tonic, and purgative medicines. On the Continent they are used for flavouring cakes.

Cardamoms are mentioned about the year 180 A.D. in a list of Indian spices liable to duty at Alexandria.

Elettaria cardamomum is a perennial herb, the rhizome sending up flowering stems from 6 to 12 feet high. The leaves are large, lanceolate, with very long sheaths at the base. The flowers are not large, and are thrown out on long horizontal stalks close to the ground. The calyx is tubular and delicately transparent. The narrow corolla tube extends beyond the calyx, and expands into three pale green lobes. There are six stamens in an outer and inner series. Only one in the inner series is fertile, the thin style passing up between the anther-cells. One of the outer series is large, expanding like a petal to form the lip; it is white, with pink or purple veins. The remaining four stamens are quite small and abortive. The fruit is oblong, from $\frac{1}{2}$ to $\frac{3}{4}$ inch long, dehiscing loculicidally by three valves. There are several closely packed seeds.

Elettaria and *Amomum* are classed by Bentham and Hooker ("Genera Plantarum") as belonging to the Zingiberaceæ, a tribe of the order SCITAMINEÆ.

CARDIAC (Gr. *cardia*, the heart), in anatomy, a term applied to the bloodvessels, nerves, &c., of the heart, and also to the nerves which originate from the cervical ganglia, and unite to form, between the arch of the aorta and the bifurcation of the bronchi, the cardiac plexus. In pathology the term is applied to a painful affection of the heart. For the cardiac sounds, see HEART. The cardiac orifice of the stomach is the upper; it derives its name from being nearer to the heart.

CARDIFF, the county town of Glamorganshire, and a parliamentary and municipal borough and port at the mouth of the Taff, 170 miles from London by the Great Western Railway. In 1881 the municipal borough had 82,761 inhabitants. The population of the Cardiff district of boroughs (which returns one member to the House of Commons) was 85,862. By the Redistribution of Seats

Act of 1885 the limits of the borough were slightly extended. The municipal borough is divided into five wards, and is governed by a mayor, ten aldermen, and thirty councillors.

The town is on the whole well built, and has obtained a wonderfully rapid increase of trade and population in the last thirty years from the Bute ship canal and docks, constructed by the late Marquis of Bute. This increase has been greatly added to by the use of Welsh coal for steamship purposes, the advantages of which were largely brought into notice by the difficulty of obtaining north country coal through the contests between miners and owners that have taken place in the northern colliery districts. Cardiff now exports annually about 8,000,000 tons, a quantity unequalled by that of any other port in the kingdom. The exports of iron and patent fuel are also very large.

The streets are wide and open, and the neighbourhood, with the sea-shore and headland of Penarth, where there are also large docks, and off which lie the Flat Holm and other islands, presents some agreeable views.

The principal edifices are St. John the Baptist's ancient church, with a good tower, and several other churches; chapels for the various denominations of dissenters; town-hall, including a police court, merchants' hall, corporation rooms, crown court, &c.; gaol; market-house; custom-house; post-office; theatre; Herbert's free school; and a very handsome infirmary, erected in 1883.

The new Bute east and west docks, built by the Marquis of Bute, lord of the manor (at a cost of upwards of £1,000,000), will admit ships of 3000 tons. A new dock, commenced in 1883, will increase the area of these docks by 35 acres—making a total area of 113 acres. It will be entered through the largest lock in the world, its dimensions being 600 feet by 80 feet, with a depth of water of 36 feet. The Roath Basin, the New Dock, and the Penarth Dock also afford accommodation to a vast amount of shipping. The average size of the vessels using the Penarth Dock is 1550 tons. Large graving docks have been constructed in connection with these docks, and also a tidal dock, a quarter of a mile long and 150 feet wide, as well as extensive ranges of warehouses.

There are staiths on the quays of the docks, with machinery of a peculiar description for the purpose of loading vessels with coal, by which the breaking of it is almost entirely prevented. Each staith is capable of shipping 600 tons of coal in a day of twelve hours. The number of vessels registered as belonging to the port in 1885 was 320 (160,000 tons). The entries and clearances average about 13,000 (4,600,000 tons) per annum. The customs revenue amounts to £15,000 per annum.

Cardiff is the ancient *Rhotastabius* of the Romans, by whom it was probably made a fortified station. It is the locality of the Arthurian legend of "The Sparrow-hawk." The castle was commenced by Jestyn ap Gwrgam, the last Welsh prince, and was completed by Robert Fitzhamon in 1110. It was the Caer Taf, or fort of Taf, which gave the name to the place. The keep, 75 feet high, and other remains of the castle still exist. Robert, duke of Normandy, was imprisoned in it by Henry I. The castle was besieged by Cromwell in 1648, and was taken by treachery. Cromwell hanged the traitor as a warning to his own troops.

The ancient city of Llandaff, now a mere village, is nearly connected with Cardiff. The modern mansion of the Marquis of Bute occupies part of the ancient castle.

CARDIGAN, a maritime county of South Wales, bounded N. by the counties of Merioneth and Montgomery, E. by Radnor and Brecknock, S. by Pembroke and Carmarthen, and W. by the Irish Sea. Its greatest length, from N.E. to S.W., is about 46 miles, and greatest breadth, from E. to W., about 40 miles. The length of sea-coast is about 42 miles. The area is 413,387 acres. In 1881 the population was 70,270.

The south-western district of Cardiganshire is level, and

also the neighbourhood of Aberayron, and several other tracts near the coast; in general, however, the surface is mountainous, especially in the northern and eastern parts. The highest lands are rugged, bleak, and barren; the lower lands afford pasturage. The uninclosed portion of the county is very extensive. There are four mountains above 1000 feet high each: Plinlimmon has an elevation of 2469 feet. The rivers are the Teify (which is said to have been the last resort of the beaver), Towy, Ystwith, Claeuwen, Rhydol, Arth, Ayron, Wirrai, and Lery. A few miles north-east of Tregaron several small mountain lakes are situated, abundantly stored with fish. The climate of this county is in winter very rough, the winds are violent, and the snow frequently remains on the mountains till late in the spring; in summer, however, and in autumn, there is a light, dry, wholesome air, which is extremely pleasant. The geological formation is that called Lower Silurian.

The soil is for the most part unfavourable for cultivation; in the mountainous districts it is thin and cold, and yields but a small produce of oats, barley, and potatoes; rye is also sown in small quantities. Wheat and barley are grown near the sea-shore. Of the whole area of the county, 443,387 acres, 280,000 were under cultivation in 1885. The corn crops occupied 60,000 acres; green crops, 14,000; clover, 45,000; and 160,000 were in permanent pasture. Of late years agriculture has been improved, but it is still far from being in an advanced condition. The management of the dairy and the rearing of stock are, however, well attended to. The number of cattle in the county in 1885 was 60,000, and of sheep 190,000.

The mines, though less productive than they were formerly, are worked in many places; and the lead, which is abundant, yields a fair proportion of silver. A little zinc ore is also found. The copper ores have ceased to be worked. There are several slate quarries in the neighbourhood of Aberystwith, but the slate is not of good quality. As there is no coal in the county, peat, which is plentiful, is the fuel chiefly consumed. The manufactures of this district are unimportant, being confined to the weaving of a small quantity of flannel, coarse woollens, and gloves. Oats, butter, and slates are exported. Coal, culm, limestone, and deals are the chief imports.

Cardiganshire is wholly in the province of Canterbury and diocese of St. David's. One member is returned to Parliament for the county. Its representation was unaffected by the Redistribution of Seats Act of 1885. The quarter sessions are held at Lampeter, and at Cardigan and Aberystwith.

Many ancient customs still remain among the country people. The marriage custom of placing the bride on horseback behind her father, who rides away until caught by the wedding party, is kept up in some places.

The name Cardigan is derived from "Caredigian," which signifies the territory of Caredig, the first king of this district, who was succeeded by a line of princes of whom little is known until the reign of Roderick the Great, who in 843 became king of all Wales. From 1092 till 1238 the Welsh of Cardigan were almost constantly engaged with the Normans. During these conflicts many castles were built in the county, and Llewellyn, in 1238, tried to make a bold stand against the Normans; but, before the end of the same century, the whole of Wales became permanently annexed to England.

Cardiganshire abounds with antiquities. There are, besides many Druidical remains, a Roman station at Llanio, and a Roman road traversing the county in a north and south direction from that place. Remains of castles are either standing, or it is evident that such fortifications have existed, at Cardigan, Aberystwith, Lampeter, Ystradmeiric, Cilennin, Llanrysted, Dinerth, Moyddyn, Aberinon, Penwedie, Castell Gwalter, Castell Cadwyan, Hên Castell, Castell Fflemis, &c.

CARDIGAN, a seaport, and the county town of Cardiganshire, is situated on the northern bank of the river Teify, about 3 miles from its mouth, 234 miles W.N.W. from London. It is called *Aberteify* by the Welsh. Its modern name is derived from "Caredigian," the territory of Caredig, the first king of the country. After Roderick the Great became king of Wales, the town was alternately a lordship of the king and the chief town of an independent district. In the tenth and eleventh centuries it was the scene of repeated battles between the Saxons, the Danes, and the Welsh princes. During the next two centuries the people were almost incessantly fighting with the Normans, and a castle was built and fortified about 1160 by Gilbert de Clare. Orinda (Catherine Phillips), the friend of Jeremy Taylor, resided in the vicinity, in a house which had formerly been a priory of Benedictine monks. The streets are narrow, except one, which is the principal thoroughfare of the town. The structure called the "Public Buildings" is a handsome edifice, and serves as a corn market and town-hall. There is also a good grammar-school. The population of Cardigan in 1881 was 2727. Cardigan was formerly the chief town of the Cardigan district of boroughs, but their total population in 1881 was less than 15,000, and under the Redistribution of Seats Act of 1885 they were deprived of separate representation. The harbour is obstructed by a bar, but ships of 300 or 400 tons can come up to the bridge at spring tides. The general trade, however, is confined to vessels of from 20 to 100 tons. The number of vessels registered in 1885 was 70 (8500 tons). The entries and clearances average 800 (30,000 tons) per annum. The imports are chiefly coals, limestone, and deals; the exports, oats, butter, and slates.

CARDIGAN BAY, a large inlet of St. George's Channel on the west coast of Wales, between Bruch-y-Pwll, off Bardsey Isle, in Carnarvon, and Strumble Head in Pembroke. The rivers Mawddach, Dovy, Ystwith, Yren, and Teify discharge into it. The greater part is said to have been, previously to 520 A.D., a populous district containing sixteen towns, and protected from the sea by dams and dikes.

CARDINAL (from *cardin-*, root of the Latin *cardo*, a hinge) is used to signify anything fundamental in a system—the hinges, so to speak, upon which it turns. The following are some of the principal uses of the word:—

CARDINAL, a prince of the church—the name of the highest dignity in the Roman Catholic Church and court next to the pope. About the beginning of the twelfth century the popes bestowed the rank of cardinal priest or deacon on any individual of the clergy or even laity, whether Roman or foreign, as they thought proper, and gave to each the title of some particular church of Rome, without any obligatory service being attached to it. Thus they made the cardinals a separate body, the appointments being for life; and the officiating priests of the Roman parishes who had previously enjoyed the title of cardinal were deprived of it. Sixtus V., in 1585, limited the number of these dignitaries to seventy, after the example of the seventy elders appointed by Moses, and this limit has never been exceeded, although the actual number has often been much smaller. All the cardinal priests bear the title of a church of the city of Rome, but several of them are archbishops or bishops of some particular diocese at the same time. The body of the cardinals, most of whom reside in Rome, is styled the Sacred College. They generally dress in a suit of black, with red stockings and a hat bordered with red; but on public occasions their costume is splendid. The pope often employs cardinals as his ambassadors to foreign courts, and the individual thus employed is styled *legate a latere*. The cardinals now alone possess the right, enjoyed at first by the whole church, of electing the pope, and all the most important offices at the Papal court are held by them.

CARDINAL VIRTUES. The four cardinal virtues are so often contrasted with the seven deadly sins that it is apt to be forgotten that the first are pointed out by Plato, whilst the second may be regarded as a list due to mediæval times. Plato, in the "Laws," selects as the four virtues upon which turn, as doors upon hinges (Lat. *cardines*), the characteristics of a virtuous life. They are, he says, *Prudence, Justice, Temperance, and Fortitude*. Epicurus modified the view of these virtues while still retaining their enumeration; for, he says, *Prudence* is a balancing of pains and pleasures—*Temperance* is the virtuous indulgence in pleasure never carried to excess—*Fortitude* enables us to avoid certain evils and so escape greater ones—*Justice* arises from the convention among men to live without mutual injury. This was the doctrine of refined self-interest. The lofty comments of Plato seem doubly noble by contrast.

It is needless to point out the defects of this early classification of virtues; but the finely conceived addition of *Faith, Hope, and Charity*, by ALBERTUS MAGNUS, thus giving seven chief virtues as against seven chief sins, and correcting the omission of benevolence, "the greatest of all these," so manifest to our own eyes, must be mentioned, the more particularly as Whewell, in quite recent times, has been overladen for perceiving the absence of charity. The Schoolman has by six centuries the priority.

The fact is that morality is not always the same; at certain epochs certain virtues are held pre-eminent, and at other times other virtues. Thus chastity was held comparatively light under the later Romans, whilst fortitude was paramount; and it would be foolish to supply more examples of such a truism. Lecky ("History of European Morals") has fully worked out the subject.

The proper division of Duties (or Virtues) is undoubtedly threefold:—Duties to God; Duties to Fellow-men; Duties to Self. Of these, the first form the basis of religion, the latter two of morality. Since, as above mentioned, the body of morality varies, so also does the enumeration of these duties in order of importance. Finally, if we admit that Virtue is not an end to be striven for as such (any more than is Knowledge or Wealth), but is rather the essential means whereby we may promote the well-being of mankind, ourselves included, it is manifest that as in ages so in individuals each epoch selects its own "cardinal virtues"—namely, those most fitted for its present needs.

CARDINAL NUMBERS. The principal numbers, on which all the operations of arithmetic turn (Lat. *cardo*, a hinge): *one, two, three, four, &c.* If the rank by numbers is to be described, ordinal numbers become necessary (Lat. *ordo*, a rank): first, second, third, fourth, &c.

CARDINAL POINTS are in like manner the chief points of the compass, N. E. S. W.

CARDINAL BIRD (*Cardinalis virginianus*), or Cardinal Grosbeak, belongs to the *FISCII* family of the *PASERINÆ*. This bird receives its name from the brilliant red colour of the plumage. The male bird is about 8 inches long, with the upper part dusky red and the lower part bright vermillion. The head is adorned with a large pointed crest, which the bird can elevate at pleasure. A black band surrounds the base of the bill, which is very strong, and of a bright coral-red colour. The female is a little smaller than her partner, and has the upper part light olive, with the tail, wings, and tip of the crest red; the lower surface is reddish-drab. The cardinal bird is found in the eastern parts of the United States, and occurs also in the Bermudas.

The male is a beautiful songster, and is often kept in cages in the United States, where his notes are so much admired that he is called the Virginia Nightingale. The female is also said to possess a song but little inferior to that of her mate. The males, when confined together, fight violently, and Wilson says that the male will often

destroy the female when both are kept in the same cage. This bird feeds on grain and seeds of various kinds, and exhibits a great partiality for maize. Its nest is usually placed in a bush, and composed of small twigs, dried herbage, and strips of bark, lined with fine grass.

CARD'ING (of cotton) is performed by a series of cylinders, covered with leather bristling with wire teeth, so arranged that the cotton is caught up, passed from one to the other, and combed out in fleeces. These, by being passed through a funnel, are narrowed into ribbons or "slivers," preparatory to the next process of "drawing."

CARDOON' (*Cynara Cardunculus*) is a plant often cultivated, and very closely allied to the *ARTICHOKE*. The thick fleshy leaf-stalks and midribs of the leaves are blanched and eaten, either stewed or as an ingredient of soups and salads. It is more used on the Continent than in this country. The French dry the flowers and use them for coagulating milk. There is a record of its cultivation in Holyrood Palace gardens in 1683. Many botanists, Linnaeus among the rest, have been of the opinion that the cardoon, which is found wild in South Europe and North Africa, is the original from which the artichoke has been obtained by cultivation. De Candolle (in "L'Origine des Plantes Cultivées") considers that this is now proved, and that there are no true characters by which they can be distinguished as species. He therefore agrees with Moris, who rejects the old, specific name for the artichoke (*Cynara Scolymus*), and adopts his name of *Cynara Cardunculus*, var. *sativa*, which regards it as a variety of cardoon.

CAR'DROSS, a village in the county, and 3½ miles W.N.W. of the town of Dumbarton, situated on the Clyde. Macaulay's grandfather was minister here from 1771 to 1789, and a short distance from the village was the castle of Cardross, where Robert the Bruce died in 1329. A tuft of trees now marks the site.

CARDS, PLAYING, rectangular pieces of cardboard used for games, are of great antiquity, and there is much uncertainty as to when and where they were first used. It is believed, however, on good authority, that they were invented in India, and thence found their way, through Italy and Spain, into Western Europe. The first positive mention of cards is in the works of Covelluzzo, a writer of the fifteenth century, who states that "the game of cards, which comes from the country of the Saracens, was brought into Viterbo (in Italy) in 1379." Another unmistakable reference to them occurs in the accounts for the year 1392 of the treasurer of the household of the French King Charles VI., where an entry appears of the payment of fifty-six Parisian sols to one Jacquemin Gringonneur for three packs of cards for the king's use. Only five years after this date the provost of Paris made an edict forbidding working people to play at cards and certain other games on work-days. It is, therefore, safe to assume that the use of them became general in France about the end of the fourteenth century. Within a very short time of this, if not before, they also came into common use throughout the greater part of Europe. Quite early in the fifteenth century we find a considerable manufacture of cards carried on in Germany, and in 1463 their importation into England was prohibited by Act of Parliament—for the purpose of giving protection to the home manufacture. They were first taxed in this country during the reign of James I., and the practice has ever since been continued. The amount of duty at present is 3d. on each pack, this being levied on the ace of spades, and in addition each maker has to pay a small sum yearly for a license. The number manufactured in England has decreased since the beginning of the present century, owing, no doubt, to the practice of playing having become less general.

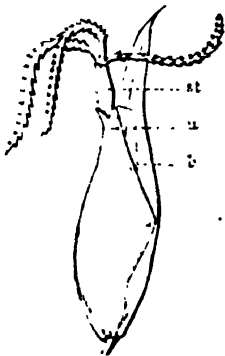
The marks upon the cards have frequently been altered since their first introduction. On the earliest ones of German manufacture the suits were hearts, bells, leaves, and

acorns; the next of which any mention is found are swords, batons, cups, and money (supposed probably to represent the warrior, husbandman, priest, and merchant), and these are still used in Italy and Spain. In the sixteenth century, however, cards were made in France bearing the marks which we still use in this country, viz. *cœur, trèfle, pique*, and *carreau*, or heart, club, spade, and diamond. The name *clubs* comes to us from the Italian suit of batons (*bastoni*), although in our packs it is joined to the quite different symbol of the trèfle, which was copied from the German acorn; our *spades* is from the Italian *spade* (swords), whilst the corresponding symbol is thought to have been copied from the old German leaf. The court cards consisted, in the first instance, of king, knight, and knave, and it was in Italy that the queen was first allowed to take the place of the knight. The French have, on two or three occasions, changed their court cards, and at the time of the Revolution they substituted Molière, La Fontaine, Voltaire, and Rousseau for the kings, and figures representing the cardinal virtues for the queens. In America, too, a republican pack has been tried, with Washington, Adams, Franklin, and La Fayette usurping the place of the kings; Venus, Ceres, Minerva, and Fortune officiating as queens; and Indian chiefs introduced as the knaves. But alterations of any kind, however ingenious, appear to be in small favour with the real card-player of to-day, who thinks of nothing but the game, and therefore prefers that the objects on the cards should be those with which he is most familiar.

(W. A. Chatto's "Origin and History of Playing Cards," London, 1848; Taylor's "History of Playing Cards," London, 1865; W. H. Willshire's "Descriptive Catalogue of Playing and other Cards in the British Museum," London, 1876.)

CAREENING (formerly earining, from the Latin *carina*, a keel), laying down a ship on one side in order to clean the other or to repair the keel. A ship careens when she turns over or capsizes and exposes her keel, and is careened when she is artificially caused to careen.

CAREX, a genus of plants belonging to the order CYPERACEÆ. The species for the most part are inconspicuous and unattractive plants. They are, however, very numerous, over 800 species having been described; but when the genus comes to be monographed, probably not many more than half that number will be retained. There are seventy species natives of Great Britain, this being the largest number of species of any genus of flowering plants in this country. Although so numerous, they serve directly few of the purposes of man or the higher animals. Their leaves are tough and hard, so that none of them are eaten by cattle except in cases of great necessity. They are for the most part inhabitants of wet and swampy grounds, and of bogs, fens, and marshes, in the temperate and northern



Female flower of *Carex*: *a*, style; *b*, bract.

hop-grounds of Great Britain the leaves of some of the species are used for tying the binds of the hops to the poles. In Italy they are used for placing between the staves of wine casks, or woven over Florence flasks, and occasionally employed for making chair bottoms. The leaves of *Carex sylvestris*, according to Linnæus, are combed and dressed, and used as a warm lining for gloves and shoes; and, thus protected, the Laplanders seldom suffer from frost-bite.

The species are distributed through temperate and cold

regions of both worlds, but in the tropics they are rare, except on mountains.

The spicules of the flowers are unisexual; the male are many-flowered, terminal, and distinct, or continuing the female spikes at the apex or base; the glumes are imbricated, and the stamens three. The female spicules are one-flowered, spicate, in the axil of glumiform bracts, the single glume forming a utricle inclosing the flower, its mouth being oblique or two-toothed; the rachis of the spicule is included within the utricle.

CAREY, HENRY, to whom we owe "God Save the King," was popular as a musical composer and dramatist in the reigns of the two first Georges. He was an illegitimate son of the Marquis of Halifax, was born about 1670, and died in 1743. His charming song, "Sally in our Alley," has outlived all his many plays and operas, which it would be quite unnecessary to enumerate. Carey was an indifferent poet and a careless musician, but the two fine compositions mentioned show that he had true genius; his life was wasted through want of application and systematic training. His authorship of "GOD SAVE THE KING" is treated of in that article.

CAREY, WILLIAM, D.D., the founder of the first Baptist mission in India, and a distinguished Oriental scholar, was born at Paulerspury, Northamptonshire, on 17th August, 1761. After a scanty education at a school kept by his father, at fourteen years of age he was apprenticed to a shoemaker at Hackleton. In 1783 he joined the Baptist communion, and began preaching, and three years later was made pastor of a congregation at Moulton. Here, in spite of having to work at his trade to support his family, for by this time he had married, he found time to acquire a knowledge of Latin, Greek, and Hebrew. In 1787 he removed to a church at Leicester, and on the formation, chiefly through his exertions, of a Baptist Missionary Society in 1792, was chosen as the first missionary. In 1794 he landed with his wife and family in Bengal, but by the upsetting of a boat he had the misfortune to lose everything intended for the support and establishment of the mission. He was, therefore, obliged to work as the manager of an indigo factory at Malda, but he nevertheless seized every opportunity of teaching and converting the natives. His efforts, however, were discouraged by the East India Company; and on being joined by three assistants from England he resolved to remove to the Danish settlement of Serampore. This he did, and the mission established there was soon in a most flourishing condition. In 1801 his reputation as an Oriental scholar caused him to be appointed professor of the Sanskrit, Bengalee, and Marhatta languages at Fort-William College, Calcutta, and he held this post until 1830. During his lifetime there issued from the Serampore press editions of the Scriptures in more than forty dialects, and in addition to supervising these he wrote a Marhatta grammar and dictionary, a Sanskrit grammar, a Bengalee dictionary, and many other works. He died 9th June, 1834.

CARIA, the ancient name of the south-western corner of what we now call Asia Minor. Lydia and Phrygia bounded it on the north, Lycia on the east, the sea on the west and south. Its chief river was the celebrated Meander, whose winding course has given a verb to our language. Sheridan's description, in the "School for Scandal," of "a beautiful quarto page where a neat rivulet of text meanders through a meadow of margin" is familiar to everyone. The country is extremely mountainous, though the mountains are not lofty; the valleys amongst them are fertile. The produce anciently was oil and figs (especially those of Cannus, very famous), as well as corn and wine. Caria was long independent, and its inhabitants spoke a tongue unintelligible to Greeks. Its chief towns were Cnidos, sacred to Aphrodite, Miletus, and Halicarnassus, the last being originally the capital. Mausolus was one of the kings

of Caria—he whose splendid tomb has given a name to the edifices we call *mausoleums*. By his time (B.C. 377) Caria was subject to Persia, and he took part in an important revolt of the satraps and subject princes, as well as in the subsequent “social war” against the Athenians. On the break-up of the monarchy of Alexander, Caria, which had, of course, formed part of his vast conquests, was divided between the republic of Rhodes and the kingdom of Pergamus.

CARIA'MA (*Cariama cristata* or *Dicholophus cristatus*) is a very singular South American bird. By some naturalists it is placed among the *GRALLÆ*, being regarded as a near ally of the cranes and trumpeters; by others it is considered a game bird, and a place has been found for it among the *GALLINÆ*. From its very striking resemblance to the *SECRETARY BIRD*, together with other peculiarities, it has been regarded by some as a very aberrant form of the *ACCIPITRES*, and to this view Sundevall and Parker lend the authority of their names.

The cariana inhabits the great solitary mountain plains surrounded by forests which extend over so large a portion



The Cariama (*Dicholophus cristatus*).

of Brazil, where its sonorous voice often breaks the silence of the desert. It occurs, but more rarely, in Paraguay. Its food consists of lizards and other reptiles, insects, and molluscos animals.

An inhabitant of the vast solitudes that form its wide-spreading home, this bird, raised on its stilt-like legs, stalks slowly about, its eyes being ever on the watch to mark the presence of the yet distant enemy. It runs with great rapidity, but it flies with difficulty; hence it is to its speed that it trusts for safety. Those who have had the best opportunities of observing these birds in their native wilds, state that the hunters cannot obtain them without considerable labour. As soon as the bird perceives itself pursued, it sets off with amazing velocity; the hunter follows on horseback, but it is not till after a sharp and tedious course, with all its windings, that the cariana, wearied out, either crouches on the ground or takes refuge in some bush. Wild as this bird is in its natural state, it is easily domesticated, and will live sociably with the other tenants of the poultry-yard. The nest is composed of dry sticks and branches, covered with cow-dung, and placed upon a low or moderate-sized tree. The eggs are generally two in number, and white. The young are covered with down, but are soon able to run. The cariana stands high on the legs, and the hind toe is considerably elevated, so as scarcely to touch the ground. The space round the eye is naked and bluish. The head is crested with light feathers, and long loosely barbed feathers cover the neck. The upper eyelid is fringed with long lashes. The plumage is

pale amber brown, with fine zigzag marking of a darker tint. The bill in the adult is coral red, dusky in the young; the legs are orange red, the iris yellow. In length it is about 30 or 32 inches.

CARIBBEEAN SEA, a portion of the Atlantic Ocean, lying between Central and S. America, on the W. and S., and the West India Islands, on the E. and N. Its length, E. and W., on the parallel of Martinique, 15° N., is 1148 miles; and its breadth, on the meridian of 72° W., due S. from Hayti, 375 miles. A channel, 120 miles wide, at the W. end of Cuba, connects it to the Gulf of Mexico. The great equatorial current, entering among the Lesser Antilles, runs W. with such force as to render a direct passage eastward along the S. coast impracticable; otherwise the navigation of this sea is easy and safe, from the absence of islands and reefs, and the rarity of storms, except near the shores of some of the West India Islands. So little, indeed, is it subject to agitation, that the Spaniards have called it the “Ladies’ Sea;” and so transparent is the water, from the whiteness of the bottom and the brightness of the sky, that corals, shells, fishes, and a varied submarine flora; can be distinguished at the depth of 60 fathoms. Off the S. coast of Cuba, at the distance of several miles, columns of fresh water gush up through the salt in such quantity, that, in calm weather, ships “lie to” and fill their water-casks. The name is taken from that of the fierce and warlike race, the tallest and most robust people in the world except the Patagonians, who formerly occupied the Lesser Antilles and much of the opposite continent. The few who survived the European occupation of these islands were taken from St. Vincent in 1795, and settled upon the island of Ruatan, and have thence spread over portions of the Mosquito coast.

CAR’IBS or **CAR’IBBEES**, the name of one of the aboriginal tribes of South America. When the Europeans first arrived in America the Caribs were in possession of the smaller islands of the West Indies, from them called the Caribbee Islands, which lie between Puerto Rico and the Gulf of Paria. They made stout resistance to the European intruders, but at last they were compelled to abandon the islands. A small number still exist on the islands of Trinidad, St. Vincent, and Dominica, and several tribes of them are found on the Orinoco and its tributaries on the continent of South America, and in the Republic of Honduras. The Caribs are distinguished from the other native tribes by their athletic appearance and their great courage and firmness of purpose. They have been accused of cannibalism. The Caribbee Islands included the Leeward and the Windward Islands, and are sometimes called the Lesser Antilles. See *ANTILLES*.

CAR’ICATURE (Ital. *caricatura*, from *caricare*, to load or overcharge), a representation or description which, though bearing a resemblance to the original, is so exaggerated as to be ludicrous. The use of caricature for giving point to satire has prevailed from a very early period. It is frequently found in connection with the arts, both plastic and pictorial, of ancient Greece and Rome; and it flourished luxuriantly, both in connection with art and architecture, during the middle ages. In England caricature came freely into use during the conflicts between the Cavaliers and Roundheads, and it has been used for political and party purposes ever since. Among the most eminent of the British caricature artists must be included Hogarth, Rowlandson, Doyle, Cruickshank, and Leech. At the present day caricature, as a political weapon, is freely used. Four or five humorous and satirical journals present their subscribers weekly with caricatures, both pictorial and verbal, of the more prominent political events and of party leaders; but the satire that finds favour to-day is of a much milder character than that which prevailed at earlier periods. Similar publications appear in most European countries, in the British colonies, and in the United

States of America. The London *Punch*, the Paris *Charivari*, and the Berlin *Kladderadatsch* have a very definite power and renown, and with very rare exceptions use their influence most worthily. The employment of caricature in literature generally dates from Aristophanes' comedies onwards. Hardly a writer of any humorous power has failed to avail himself of so powerful a weapon against an opponent. Caricature was also anciently freely used on the stage; we are annoyed, while we laugh, at the absurd caricature of the person and the teaching of Socrates in the "Clouds" of Aristophanes, and his portrait of the demagogue Cleon was so true to life that no one but the poet himself dare act it. In the same way other dramatic caricatures have proved so dangerously exciting that they have been in all ages frowned upon, and an attempt to personally caricature some cabinet ministers on the stage in our own day was promptly suppressed. At the same time the caricature of contemporary plays and brother actors by comedians is not only in full force, but is the best resource of the burlesque stage.

CARIES, a disease of bone, in which there is a rotting and peeling away of the substance, which greatly resembles the process of ulceration in the soft tissues. There are two forms of this disease—the *simple*, most common in the flat or short bones, and the *fungating*, affecting the ends of the long bones, causing disorganization of the joints. In this disease the bone is disintegrated as the result of chronic inflammation of its tissue. When this has existed for some time an abscess forms over the part affected, which ripens and bursts, and in the discharge which follows small particles of bone come away. When the opening is examined by means of a probe, the surface of the bone is felt to be bare, soft, and gritty. The constitutional causes of this disease are usually either scrofula, syphilis, or the excessive use of mercury, and the treatment must be varied accordingly. Where scrofula is the cause the patient's health must be supported by means of good food, pure air, and the use of tonic medicines, and those of a highly-nourishing character, such as cod-liver oil. Local treatment must be directed towards the removal of the diseased portions of bone and the formation of a healthy granulating surface, and for this purpose lotions of the dilute mineral acids are useful. Sometimes the diseased portion can be removed by a surgical operation, so as to leave a cavity, which will be filled up on the healing of the wound, but at other times the whole of the bone must be excised, or amputation may be necessary. Cries of the teeth is a very common affection, from which, indeed, few persons altogether escape. It consists of a softening and disintegration of the surface of the tooth, which gradually penetrates towards the centre. As the cavity enlarges, and the pulp of the tooth is reached, the presence in the food eaten of such irritants as salt or sugar, or of anything cold, may bring about an attack of toothache, and cause considerable suffering. The causes of this complaint are rather obscure. In scrofulous and ill-nourished persons it may be the result of general weakness, while where the general health is good the presence of portions of food in the crevices of the teeth may lead to a softening of the enamel and the destruction of the substance. As a preventive measure the teeth should be carefully cleansed two or three times a day. They should never be used to break any hard substance, as the enamel may be easily fractured, and decay will result. When a hole has been formed the best treatment consists in the removal of the decaying portions, and a filling of the cavity with a hard substance, if possible with gold.

CARIGNAN, a small town of France, in the department of Ardennes, the scene of a severe battle between the French and Germans, 31st August, 1870. On the plain of Douzy, near the town, and at the encampment of Vaux, a part of MacMahon's army, retreating before the Germans, turned round and made a stand. After a severe engage-

ment, in which the same positions were taken and retaken several times, the Germans turned the flank of their enemies, who were compelled to fall back upon Sedan.

CARILLON, a large peal of bells, suitable for playing somewhat elaborate music; also the tunes so played. A peal of bells for ringing does not exceed twelve, but the carillons in Belgium are very extensive, varying from forty bells at Antwerp to forty-eight at Ghent. Carillons are chimed; that is, are struck by an independent clapper on a fixed bell, worked by machinery. Great flexibility of performance is thus gained, but the special wildness and clang of the bells, as properly rung, is quite lost. Carillons used to be played by hand (or rather by *fiat*), and such machines are still extant; but these are now superseded by the more purely mechanical apparatus, turned with a winch or by clockwork. See CHIMES, CHIMING MACHINERY.

CARINA, in botany, the two oblique front petals of a papilionaceous flower, united by their contiguous edges into an organ having a figure something like that of the keel of a boat.

CARINARIA. See FIROLIDÆ.

CARINATÆ is the term employed by some naturalists to designate those birds which have the *sternum* or breast-bone furnished with a keel. In this division come all living birds, with the exception of the order STRUTHIONES.

CARINTHIA, in German *Kärnten*, a duchy and crown land of the Austrian empire, part of the former kingdom of Illyria. It is bounded on the N. by Styria and Salzburg, on the E. by Styria, on the W. by the Tyrol, and on the S. by Italy, Görz, and Carnia. The surface of the country is mountainous, with long deep valleys intervening, that of the principal river, the Drave, opening near Villach and Klagenfurt into a wide plain. The Drave intersects the province in a course of 150 miles from W. to E. The chief industry is cattle-rearing, and its principal wealth is derived from its mines. Iron is found throughout the whole extent of the primary Alpine chain, and is also procured in the Carnic Alps. Copper is mined in several places, but although the quantity of ore is inexhaustible, the hardness of the stone in which it is found, and other difficulties, oppose serious obstacles to the attainment of any great supply of metal. The lead mine of the ore-mountain near Villach is the largest and most productive of that metal in the empire. Zinc, silver, and quicksilver are likewise met with, and near Hüttenberg antimony is found in conjunction with iron. In the valley of the Drave are the important lakes of Worthersee and Ossiachersee. The greater part of the inhabitants are Catholics and of the German race; the rest are chiefly of Slavonic derivation. The province has an area of 4006 English square miles.

CARISBROOKE, a considerable village in the Isle of Wight, picturesquely situated on a bold acclivity, about a mile south from Newport. The scenery in the neighbourhood is charming; in fact, there are few districts so rich in natural beauties. The church, dedicated to St. Mary, was completely restored in 1871-72, at which time several objects of interest were discovered. The most interesting monument is that to Lady Dorothy Wadhams, sister to Lady Jane Seymour. The massive pillars are Norman; the church is said to have been founded two years before the Conquest. The castle is too well known to need much description. It occupies the summit of an artificial mound, at a total elevation above the sea-level of 239 feet. It was formerly encircled by a broad deep moat, which is now dry and overgrown with the smoothest turf. The walls inclose an area of 12 acres. The parts most worthy of note are—the keep, supposed to be Saxon; the garrison well, 240 feet deep; and the ruins of the apartments in which Charles I. was confined, from which he vainly attempted to escape. After the execution of the king his two youngest children were imprisoned in the castle, and the Princess Elizabeth died here. The castle was completely remodelled

as a defensive work in the reign of Elizabeth, by Gianibelli, the famous Italian engineer. It was unsuccessfully besieged by the French in 1877, and seized by the Parliament at the outbreak of the Civil War in 1640. It was used as a prison during the Commonwealth, and for French prisoners of war during the great revolutionary struggle. The governor's residence, just inside the castle, is modernized out of the original hall. The discovery of a Roman villa at Carisbrooke proved the occupation of the island by its Roman masters. There are many historical facts connected with Carisbrooke. Here the old Roman conqueror set his foot and left his mark; hither came the Saxon chief (Withgar), here he gained his great battle, raised part of the stately castle, and called the whole place after his own name (Withgarisbyrig); hither also came the Norman victor, and perchance worshipped within the walls of the ancient church. A Dominican priory for eighteen nuns was erected at Carisbrooke in 1867 by the Countess of Clare. The population of the parish, which extends over 8800 acres, is 6304.

CARISSIMI, GIACOMO, the celebrated musical composer (1582-1674), was a native of Padua. After holding the post of director of the cathedral music at Assisi he went to Rome, where he spent the remainder of his life. His "Jephthah" is the parent of oratorio, and in it he brought recitative to a pitch which has never been surpassed. The fine chorus, "Hear, Jacob's God," in Handel's "Samson," is, one regrets to say, bodily stolen from Carissimi's "Jephthah," where it stands as "Plorate, filie Israel;" but the fact shows the greatness of the earlier master, that he should tempt his successor to the plagiarism. Croft and Aldrich also dug firmly in the mine of Carissimi's sacred compositions. Hullah performed his "Jephthah" in London about 1860, since which time it has been a favourite work; and Leslie produced the cantata of "Jonah" somewhat later. The music is surprisingly free and modern, considering the early date of the composer. Bononcini and Alessandro Scarlatti were amongst the pupils of Carissimi.

CARLINGFORD, a seaport of Ireland, in the county of Louth, on a bay of the same name, 10 miles E.N.E. of Dundalk. It was formerly of much greater importance than at present. It is now chiefly famous for its oyster fishery. Carlingford claims the honour of being the landing place of St. Patrick in the fifth century. In a castle of which there are interesting ruins, King John held his court on his visit to Ireland in 1210. There are also the remains of an abbey founded in the fourteenth century for the Dominicans; it was used by the soldiery of Cromwell as a stable in 1649.

CARLISLE, an ancient city, and a parliamentary and municipal borough, is the county and assize town of Cumberland, and is about 800 miles N.W. by N. from London by the North-western Railway, and about 9 miles from the Scotch border at Sark Bridge. Eight railways—viz. the London and North-western, the Midland, the North-eastern, the North British, the Caledonian, the Glasgow and South-western, the Carlisle and Silloth, and the Maryport and Carlisle—converge in the magnificent Central Station, which has been recently enlarged and rebuilt; and Carlisle is thus in direct communication with all important places in Great Britain, while from the ports on the Solway, from Barrow-in-Furness, and from Stranraer, it enjoys constant steam communication with Ireland and the Isle of Man, and also with Liverpool.

Carlisle, by some writers, is said to be of British origin, but no remains of that period are positively known to have been found within its area, though the soil in the older part of the city teems with relics of the Romano-British period—coins, pottery, bronzes, gems, &c. It was the *Lugurallum* of the "Itinerary" of Antoninus, a name which was abbreviated into *Lluol*, this in later times becoming (with the affix *Caer*) *Caerlluel*, or *Carlisle*. After the departure of the

Romans it became a British city within the British or Welsh kingdom of Strathclyde; but was in the seventh century absorbed by Egfrith, king of Northumbria, into his realm, and by him handed over to St. Cuthbert. In 876 it was laid waste by Haldene, the Dane, in which condition it remained until William Rufus, in 1092, refounded the city, built the castle, and made Carlisle and the district connected with it part of the kingdom of England. From that time down to the union of the kingdoms of England and Scotland under one sovereign, Carlisle was a fortress of great importance, for it commanded the only road, on the west side of the island, by which wheeled conveyances could pass from the one country to the other. Its subsequent history is thus intimately connected with the history of the wars between the English and the Scotch, and the lord warden of the western marches between England and Scotland, or his deputy, lay in Carlisle Castle. It has on several occasions been besieged—by Robert Bruce in 1311, by the Parliamentarians in the seventeenth century, and by Prince Charles and the Highlanders, and afterwards by the Duke of Cumberland, in 1745. Prior to the union of the two crowns Carlisle was a populous place, but James I. lost no time in breaking up the garrison, and as the place had no trade it sank into decay, and the population fell to 2000 at the beginning of the eighteenth century, as against 6000 at the beginning of the seventeenth century. In 1763 the inhabitants numbered about 4000, and in 1800 they had increased to about 10,000; at the census in 1881 the number was 35,844—an increase of nearly 5000 since 1871. After the year 1745 a road, passable for wheeled vehicles, was made to Newcastle, and a considerable number of Scotch and Irish weavers settled in the place; a public brewery was also established. At this day Carlisle has a large share in the cotton trade in all its branches, and it exports a large amount of ale to Australia and India. The biscuit, timber, and bacon trades are all extensively carried on, and large factories have been built for the manufacture of hats, and for lithographic printing. Extensive iron-foundries also exist. A great part of the population are employed by the various railways, who have extensive workshops in and near the city.

Carlisle, though not upon the sea, was until lately a port, and was connected with the sea by a ship canal to Bowness-on-Solway, a distance of 11 miles. This canal was completed in 1823, but it was run dry about thirty years ago, and the Carlisle and Silloth Railway runs along its bed. The custom-house authorities have recently reduced Carlisle from the rank of a port, and made it subordinate to Whitehaven. The situation of Carlisle somewhat resembles that of the Old Town of Edinburgh; it stands on a hill, which is steep at one end only, and on the steep end stands the castle, looking out to Scotland, with the city behind it. The site is nearly inclosed by three streams. The largest of these, the Eden, famous for its salmon, runs past the city in a north-western direction into the Solway Firth; the other two, the Caldew and the Petterill, fall into the Eden on the west and east sides of the city respectively. A handsome elliptical bridge of five arches, and of white freestone, was erected over the Eden in 1812. Two stone bridges, of one arch each, are thrown over the Caldew, and one over the Petterill of three arches, about a mile from the town. The castle is maintained as barracks for the depot of the Border Regiment; its keep is a very fine and complete example of a Norman keep of the second magnitude. The city was formerly walled, and had three gates, known respectively as the English, Scotch, and Irish gates, and also a citadel at its southern end. The gates and the citadel have been pulled down, and on the site of the latter two large assize courts were built in 1807. The walls have also disappeared, with the exception of a portion of the western curtain wall. Large and handsome suburbs have grown up around the area to which the old city was limited.

A priory of Austin canons was founded at Carlisle by Henry I., who afterwards made it the seat of a bishop, with jurisdiction over the earldom of Carlisle, or so much of the modern counties of Cumberland and Westmoreland as were formerly in the kingdom of Strathclyde. In 1856 the rest of Cumberland and Westmoreland (with the exception of the parish of Alston) were added to the diocese of Carlisle, and also the district known as Lancashire-over-Sands. The priory was created by Henry VIII. into a dean and chapter, the last prior becoming the first dean. The establishment consists of a dean and four canons, also several honorary canons, two minor canons, and other officials. The cathedral has suffered much; great part of the nave was pulled down at the time of the Parliamentary troubles; the fragment that remains is Norman. The choir is unusually large, and is Early English; it suffered severely from fire in 1292; its east window, on account of its tracery, is considered the finest in England. Both the Black and Gray Friars formerly had establishments in Carlisle. The city anciently consisted of only two parishes—St. Mary's and St. Cuthbert's; the church of the latter was rebuilt in 1778. The nave of the cathedral was the church of St. Mary's parish, but a separate church has been recently erected. There are in addition six modern churches, and many other places of worship. The grammar-school, founded by Henry VIII., has been reconstituted, and new school buildings are in course of erection, as are also public baths. The ten years prior to 1883 were years of great activity in the building trade, the chief work having been the rebuilding of the Central Railway Station, and of a viaduct to connect the old city with its western suburb, from which it was severed by the lines of railway running north and south. Several factories have been built, and a great deal has been done in house building, a whole district in Denton Holm having been covered with workmen's houses, while large squares have been called into existence on the estates of the corporation and the Duke of Devonshire for the accommodation of the wealthy classes. The Cumberland Infirmary, situated near the city, has been enlarged, and is a noble pile of building, having 100 beds. Carlisle has also a fever hospital, dispensary, and several charities and benevolent institutions.

The municipal and parliamentary limits of Carlisle are identical. The city formerly returned two members to the House of Commons, but was deprived of one by the Redistribution of Seats Act of 1885. Under the Municipal Reform Act the town is divided into five wards, with ten aldermen and thirty councillors. The moot-hall, guild-hall, or town-hall, as it is variously called, is a building of Queen Anne's time. The city cross, erected in 1682, stands in the market-place, in front of the town-hall. The earliest charter granted to the city was by Henry II. There are eight trade guilds in Carlisle, who formerly used to meet in an Edwardian building, sometimes called the guild-hall, but properly Redness Hall, but the guilds themselves have almost ceased to exist.

CARLISTS, a name applied to those who supported the claims of Don Maria Isidor Carlos de Bourbon (generally known as Don Carlos), the brother of Ferdinand VII., to the throne of Spain. His brother had thrice married without issue, and Carlos thus felt certain of succeeding him. He, however, married a fourth time, and the result was a daughter, Maria Isabella, the late queen of Spain. As the Salic Law, excluding females, had been abrogated, the hopes of the Carlists were thus cut off; but during the illness of the king, in 1832, they contrived to induce him to reinstate the law. He revoked it again, however, as soon as he had partially recovered; and the consequence was that on his death Don Carlos effected a rising to support his claims; but a quadruple alliance of Spain, France, Portugal, and England, was entered into against him, and he was compelled to leave the country. He surrendered

his claim in favour of his son, also named Don Carlos, in 1845, and retired to Trieste, where he died in 1855. Don Carlos, the younger, also known as the Count of Montemolin, after an unsuccessful effort to obtain the throne, was arrested in France in 1860, and signed a renunciation of his claim. He died in the following year. The struggle was, however, again commenced in 1871 by the latter's nephew, who at first met with some successes, but after five years of desultory fighting was completely defeated, and compelled to flee into France. No further attempt to kindle rebellion has since then been made.

CARLOVIN'GIANS. See KARLINGS.

CAR'LOW, an inland county of the province of Leinster, in Ireland, is bounded E. and S.E. by the counties of Wicklow and Wexford, S.W. and W. by Kilkenny, N.W. by Queen's County, and N. by Kildare. Its greatest length, from north to south, is 29 English miles; breadth, east to west, 20½ miles; area, 346 square miles, or 221,342 acres. The population in 1881 was 46,568.

Carlow is the smallest county, except Louth, in Ireland. The whole county may be considered as an extension of the great central plain of Ireland. It is traversed in a direction nearly parallel to its western side by the Barrow, which forms a portion of the boundary between Carlow and Kilkenny. The Barrow has been made navigable through its whole course in this county, and affords the means of a considerable export trade to Carlow, the assize town, which is situated near this river's entrance into the county. The Slaney flows through the eastern part of the county. Carlow derives its chief facilities of transport from the Barrow navigation, which affords a water-carriage south to Waterford, and north by the Grand Canal, a branch of which meets it at Athy, to Dublin and the Shannon. The greatest part of the surface of the county consists of limestone, but the eastern side is a field of granite, extending from the great granite chain of Wicklow and Wexford. The great coal-field of Leinster begins in the western edge of the county, at Gallows Hill Bog. Carlow flags is a name given to a sandstone found in this county, which is easily split into layers. Porcelain clay is found near Tullow, but no commercial advantage has as yet been taken of this valuable earth. In the limestone district the soil is gravelly but warm; it is lighter and more peaty in the granite district. The crops generally raised are potatoes, wheat, barley, and oats, the proportion of each being pretty much in the order in which they are here enumerated. The system of farming in a great part of Carlow may be said to be good, and on the whole the county is a rich one. The manufacture of coarse woollens was at one time carried on to some extent in Carlow, but the trade is now altogether gone. The county is essentially agricultural, and its staple is the raising and manufacture of provisions, especially corn, butter, flour, oatmeal, cattle, and pigs. On the Barrow navigation there is a fall of rather more than one foot per mile, which gives a great water-power, available for mills at almost every weir, and the number of corn-mills along the line is accordingly very great. Corn-mills in Ireland are generally large edifices, and many of those in the county of Carlow belong to the first class of such buildings. The provision trade consists chiefly in bacon for the home market. Large quantities of barley are malted by the resident maltsters and disallers.

The county is divided into seven baronies—Carlow, Forth, Idrome East and West, Rathvilly, and St. Mullins, Lower and Upper. The chief towns are—Carlow, Bagnalstown, and Tullow. It is in the diocese of Leighlin. It returns three members to the House of Commons, two for the county, and one for the town of Carlow. The number of voters on the county register in 1885 was 2500.

The chief antiquities of the county are military, cromlechs and the cathedral church at Old Leighlin, where a synod was held in 630 to settle the time of Easter, being the

only pagan and ecclesiastical monuments of interest. Of the cromlechs one near Carlow is the most remarkable, the covering-stone weighing nearly 90 tons. Of the castles those at Carlow, Tullow, and Leighlin Bridge are the most ancient. Cloghgrenan, a castle of the Butlers on the right bank of the Barrow, is still standing. Clonmore, another stronghold of the same family, situated near Hacketstown, remains in a state of good preservation; it is a strong pile of 170 feet square, flanked with square towers at the angles. In ancient times Carlow formed a portion of the principality of *Ily Kinslagh*, and constituted the districts of *Ily Cabanagh* and *Ily Drone*. It was made shire-land in the time of King John, under the name of Catherlogh.

CARLOW, a parliamentary borough, the county town of Carlow, is situated on the Barrow, 40 miles S.S.W. from Dublin. The boundaries of the ancient borough, including only that portion of the town which stands upon the left bank of the Barrow, were extended by the 2nd and 3rd Will. IV. c. 89, so as to embrace the suburb of Graigue, in Queen's County, on the right bank of the river. The population in 1881 was 7185. Carlow returns one member to Parliament. The number of voters on the register in 1883 was 290.

The town of Carlow grew up round the castle, which was founded here by the early English conquerors about the end of the twelfth century. It was erected into a borough by William, earl of Pembroke, about 1208, and was surrounded with walls in 1362 by Lionel, duke of Clarence, who removed the king's exchequer hither from Dublin. The most remarkable object of antiquity in Carlow is the castle, now in ruins. It has undergone several sieges; in 1798 it was attacked by a mob of insurgents, many of whom were intoxicated. They were easily repulsed, but about 600 were killed, for no quarter was given to them in their flight, and some having taken refuge in houses in the town, the savage soldiery set fire to the buildings. Its dilapidation has been comparatively recent. The whole structure, a square of 105 feet, with massive round towers at the angles, was standing in 1814, when an injudicious attempt was made to modernize it by piercing new windows and diminishing the thickness of the walls, in consequence of which more than one-half of the building fell to the ground. The town consists chiefly of two main streets, and is connected with the suburb of Graigue, in Queen's County, by a handsome stone bridge of five arches over the Barrow.

The public buildings are a Roman Catholic cathedral, several Protestant and Roman Catholic churches, Roman Catholic college and school, two nunneries, Christian Brothers' school, Presbyterian, Methodist, and Friends' meeting-houses; county court-house, prison, infirmary, and union workhouse; the district lunatic asylum, a fever hospital, and a barracks.

A branch of the Great Southern and Western Railway connects Carlow with the metropolis, and with Kilkenny and Waterford. The assizes for the county are held here, also quarter and petty sessions. The Barrow affords great facilities of export to Dublin and Waterford. There are in the town and its vicinity several flour mills and malt houses, also an extensive brewery; butter of superior quality is largely exported.

CARLSBAD (Ger. *Karlsbad*, Charles' bath), a town of Bohemia, circle of Elbogen, on the Töpel, near its junction with the Eger, 70 miles N.N.W. of Prague, famous for its hot springs. These are the hottest warm springs in Europe, the highest temperature being that of the Sprudel Hygeia springs, 165° to 168° Fahr., while many others range from 133° to 157° Fahr. The total discharge per day is nearly 2,000,000 gallons. The matters held in solution are carbonate and sulphate of soda, chlorine and sodium, and carbonate of lime. Of the latter, in some of the springs a deposit is rapidly formed. The resident inhabitants number about 7500, but during the season,

from June to September, the population often amounts to 15,000. It is the most aristocratic watering-place in Europe. The town, which belongs to the Emperor of Austria, occupies the bottom of a narrow valley, between steep granite mountains, and consists mainly of lodging-houses and hotels. The springs are said to have been discovered in 1376 by the Emperor Charles IV., who, when hunting in the vicinity, was attracted to the spot by the cries of a hound that had fallen into one of the springs. A celebrated congress was held here in 1819.

CARLSRUHE (English, "Charles' rest"), the capital of the grand-duchy of Baden, is situated about 33 miles S. from Heidelberg by the Mannheim and Baden Railway, and has a population of 50,000. It owes its origin to differences which arose between the Margrave Charles William and the townsmen of Durlach, in consequence of which, in 1715, that prince began to erect the present town round his hunting castle. It is built on an elevation about 4 miles E. of the Rhine, and 13 from the Black Forest; its form is that of an extended fan, the grand-ducal palace constituting the central point, from which the streets diverge. The streets commence from a semicircular row of handsome houses which fronts the palace, and is called the Great Circle. The style of the houses is various; some are in the Dutch, some in the French, and many in a mixed Greek and Roman style. The palace is chiefly remarkable for its tower, called Bleythurn, which stands in its centre, and for a marble saloon, in which the meridian of Cassini was fixed. The right wing of the edifice contains the public library of 90,000 volumes, a collection of antiquities, coins, &c.; and the left wing, the church of the court. The view from the Bleythurn is splendid, comprehending the whole city and the Hardt Forest, which newly surrounds the town, and is pierced by roads corresponding to the several streets; beyond this, to the west, are seen the Vosges Mountains and the windings of the Rhine, the Black Forest Mountains on the south, and those of the Bergstrasse on the north. The Great Circle contains the government offices and the palace of the Margrave Maximilian. Carlsruhe has nine public squares, the finest of which is the market-place. The stone pyramid, with an inscription in memory of Charles William, the founder of the place, whose remains are inclosed in it, stands in the centre of the square. The Protestant, the Catholic, and the garrison churches are handsome buildings. The building for the legislative assembly is three stories high, and contains two fine halls for the sittings of the two chambers, besides residences for the president, officers, &c., and depositories for the archives and papers. The town possesses a botanical garden, a veterinary school, four hospitals, a deaf and dumb asylum, and other useful and benevolent institutions. There is a theatre attached to the palace. The inhabitants derive their livelihood principally from trade, mechanical employments, and manufactures. The chief manufactures are silks, cottons, carpets, woollens, jewelry, tobacco, leather, and articles of luxury. The palace gardens and those called Amaliensruhe are always open to the public, and afford pleasant promenades. There are also many attractive spots in the neighbourhood.

CARLUKE, a municipal town in the county of Lanark, near the Clyde, 6 miles N.W. of Lanark. It has manufactures of cotton, and coal, iron, and lime works. There are a large number of orchards about the town. About 2 miles distant is Milton-Lockhart, where Lockhart, the biographer and son-in-law of Sir Walter Scott, died. At Lee, also in the vicinity, is preserved the famous Lee Penny mentioned in the "Talisman." Population, 3792.

CARLYLE, THOMAS. There might be a half-humorous touch of wholesome self-contempt in Thomas Carlyle's allusions to his family tree, as where he gives a quizzical report of a vague tradition that one of his progenitors, in the times when robbery was the staple trade

of the Border, got hung for cattle-stealing—"my remotest outlook," he says, "into the past." Yet, in spite of such playful deprecatory sallies, it was one of his fundamental principles, in writing a biography, to trace the genealogy of his subject with minute care; and if ever there was a case in which the pedigree of an author was of essential significance to the student of his life and works, it is to be found in the case of the great "writer of books" who chose to be buried with his humble kindred in the kirkyard of Ecclefechan rather than occupy a tomb in Westminster Abbey. Though his immediate kindred were of the peasant class, he bore a name which had been conspicuous for ages in the annals of his native province. Under the Bruces, with whom they had come from beyond the Solway, the Carlyles were landholders in Annandale—indeed one head of the house was brother-in-law of the Bruce; and in the fifteenth century the descendant of Margaret Bruce became Lord Carlyle of Torthorwald. From the time of Mary Stuart, when Lord Carlyle was one of the leaders on the losing side, the family fortunes declined, the members of the house sinking away into the ranks of the common people. A Dumfries antiquary traced Thomas Carlyle's ancestry, with apparent success, through ten generations to the first Lord Torthorwald; and though there was much laughter over this portentous document when it reached Cheyne Row, Carlyle himself—one of the most hawk-eyed of genealogists—was inclined to think that the descent was real. Not that he laid any stress upon it; of his mother, who had been a domestic servant, he testified that she was to him "a woman of the fairest descent—that of the pious, the just, and the wise." Though, doubtless, he was mistaken in supposing there had never been another such man as his own father, there is nothing finer in his "Reminiscences" than the filial tribute to old James Carlyle. That Ecclefechan stonemason and farmer, according to his son, "walked as a man in the full presence of heaven, and hell, and the judgment;" but there was truth as well as wit in the commentary, that it was in the presence of the two latter more particularly that the old man walked. The gentle mother owned, amid her tenderest recollections of the dead, that she was never able to understand her husband, and that her affection and admiration had always been obstructed. His children dared not freely love him. He was distinctly narrow in his range as well as tempestuous in his temper; but there was a root of goodness even in the very faults of the somewhat savage old Borderer, whom the son describes as "emphatic beyond all men," having in his voice no need of oaths, for "his words were like sharp arrows that smote into the very heart." Under the harsh exterior there lay a fount of true affection, and even of tenderness; that was unspeakably pathetic when a great sorrow had broken down the hard crust of reticence within which it lay concealed. Then "it was as if a rock of granite had melted, and was thawing into water." A more literary vernacular man was not to be found in the whole expanse of Annandale; it was refreshing to hear him talk, if only for his mastery of phrase. "Am not I also the humble James Carlyle's work?" writes his son, after speaking of the houses the old man had built. This question may safely be answered in the affirmative. Edward Irving, after conversing for a while with the sire, turned to the son and said, "I have often wondered where you acquired that peculiar, original, and forcible manner of expressing your ideas. I have discovered that it is an inheritance from your father." He had got more than his marvellous command over words from the same source: the basis of character was alike in both. Well might the son say, "His spirit seems to have entered into me; I seem to myself only the continuation and second volume of my father." Nor was the mother, whose portrait occupies some of the most winsome pages of "Sartor Resartus," and who was of a lighter, sunnier disposition, yet possessed of a deeper,

truer piety, without influence in the shaping of the son's character and life. If his robust Norse qualities came from the father, Carlyle's delicacy of insight and poetical sensibility were derived from his mother.

There are few things in the entire field of biography more startling and impressive than the outcome of the life which opened on 4th December, 1795, in a little cupboard of a room, 9 feet by 5, over the arch at Ecclefechan. The stonemason's son died, by all but universal consent, the greatest British man of letters of his century; and there were some who clearly perceived that this would be the case before he had done anything. Thomas Murray, a fellow-student, who afterwards became the historian of Galloway, writing as a lad to Carlyle, launches out in praise of his friend's style, especially of its "affectionate pathos," and declares: "The time will come when these our juvenile epistles will be read and probably applauded by a generation unborn; and the name of Carlyle at least will be inseparably connected with the literary history of the nineteenth century." Edward Irving, too, that peerless friend, saw still more distinctly what was coming. "One day," he exclaimed, "we two will shake hands across the brook; you as first in literature, I as first in divinity, and people will say, 'Both these fellows are from Annandale. Where is Annandale?'" All his fellow-students who came near him recognized the fact that he was not like other men—that he was superior both in character and intellect. By some he was dubbed familiarly "The Dean," or "Jonathan," indicating their perception of the likeness his style bore to that of Swift. Dr. Chalmers, from the hour he first met him in Irving's company at Glasgow, never ceased to talk of him; and even the fair "Blumine" of "Sartor," Margaret Gordon of Kirkecaldy, though obeying her aunt's injunction not to become engaged to the poor struggling schoolmaster, told him in her farewell letter that already his abilities were beheld by his acquaintance "with wonder and delight," and that in time they must be known to the world. "Genius will render you great," she said; "may virtue render you beloved!" Never were the predictions of sympathetic friends more amply fulfilled. Many years have passed since the greatest thinker in America asserted that Carlyle's influence might be traced in every new book. Ever the *Quarterly Review*, which, since his death, has sought to minimize his worth, was constrained on the appearance of his collected works to acknowledge that he had "produced a greater impression upon his generation than any other living writer." "No literary man in the nineteenth century," says Mr. R. Holt Hutton, one of his severest critics, "is likely to stand out more distinct, both for flaws and genius, to the centuries which will follow." John Morley, far enough from being an unqualified admirer, declares that his intellectual career "has exercised on many sides the profoundest sort of influence upon English feeling;" that in stimulating moral energy and kindling enthusiasm for virtues worthy of enthusiasm, he has not been surpassed by any contemporary teacher; and that "whatever later teachers may have done in definitely shaping opinions, in giving specific form to sentiment, and in subjecting impulse to rational discipline, here was the friendly fire-bearer who first conveyed the Promethean spark, here the prophet who first smote the rock." "Ask a well-read Englishman," said a distinguished French critic a few years ago, "who are the men who think to-day in the queen's dominions, and he will be sure to assign the pre-eminence to Thomas Carlyle." He produced forty volumes, historical, literary, political, moral, and religious; and for at least forty years he was one of the mightiest literary forces in Britain—even in this crowded nineteenth century a figure standing out almost with as much distinctness above his contemporaries as Samuel Johnson in the eighteenth—a century in which it was so much easier to be seen. More than any other man of our time, he has influenced the

pulpit, the platform, and the press all over the English-speaking portions of the globe. Since his death, by grave indiscretions of his literary executor, shadows have gathered around his name, and there is much temporary bewilderment and confusion in the current estimates of his worth. But the reaction of which he has become the victim is only a transient phase of feeling. It owes its existence, to a large extent, to the malice of the literary triflers, a class whom he despised, and therefore it must soon pass away.

In tracing the influence exerted by Carlyle's writings on literature and on life, it may at the outset be claimed for him that he has done much to exalt and bring to perfection prose composition. No doubt it has been the fashion in many quarters to decry his style. It has been said that he has only an uncommon way of saying common things. Wordsworth, in conversation with Emerson, complained of his obscurity and pronounced him "a pest to the English tongue;" but, in spite of his fine feeling of tenderness for Burns, Wordsworth held that no Scot can write English. By many Carlyle has been charged with employing what they call a German style; but long ago Tieck spoke of his style as "so thoroughly English." Robert Chambers, who had no style of his own to boast of, declared that Carlyle's was "painfully studied." The truth is that Carlyle's offence lay in speaking in his own natural voice instead of using that conventional style which has so often served to conceal or to give inadequate expression to thought. For this he substituted the plain-speaking of colloquial intercourse. Despising the artificial and frigid phraseology of the schools, he freely employed the fresh and beautiful idioms of daily speech. If there is a pronounced mannerism in his writings, it is only because he was so true to his own pronounced individuality; no taint of affectation marred the manner. One of the first things remarked in conversing with Carlyle was; that he spoke exactly as he wrote. His word, whether spoken or written, was always in harmony with the thought or feeling to be expressed. On the printed page you see his thoughts visibly shaping their vehicle as they rise in their author's mind. It was the matter and the emotion that made his style; even his private letters, written in hot haste to catch the post, and addressed to simple countryfolk, his own kindred, often contain passages equal, for graphic force and delicate beauty of form, to the daintiest cabinet gems that adorn his greatest works. There must be mannerism in writings that are so completely moulded by the independent original thought of a vigorous mind, fired by a sublime passion for truth; but it would be a profound mistake to suppose that this mannerism must of necessity be the result of affectation. Carlyle's mode of writing was simply the reflection of the man, and always in strictest harmony with what he had got to say. One of his latest German critics, Eugen Oswald, observes that much in Carlyle's writings that is commonly described as of German origin is really part of the writer's idiosyncrasy. If some are repelled by the expression while others are fascinated, it is only because the former are wedded to conventional forms and out of accord with the intense and volcanic nature of the man.

Realistic, his style was also cosmopolitan. It is not only a departure from Johnsonian rotundity and Horatian smoothness, from the polished prettiness and pettiness of the eighteenth-century writers, whom so many praise but few comparatively read; it is in accord with—if, indeed, we might not rather say that it has been the most potent instrument in creating—the temper of a time that is aiming above all at Realism. Carlyle was a Scotsman and a patriot, clinging with a fond and almost passionate tenacity to much more than the dialect and the accent of his native land. Small respect had he for the Edinburgh wits of Burns' day—men often as destitute of patriotism as of lofty principle; on the other hand, his heart thrills with sympathy at the thought of that love of country which

glowed so brightly in the bosom of Burns. But Carlyle is a wise cosmopolitan patriot, who truly sympathizes with other lands because he has first loved his own. Hence he enriches his discourse with all the treasures of thought, as well as of choice and fitting epithet, that he has gathered in the vast expanse of the world's literature. In the same spirit he does not scruple to use many of the freedoms falsely supposed to be permissible only to the composer of verse, flashing out sudden bursts of homely laughter, or almost savage scorn, or tenderest pathos, in quick succession, according to the theme and the varying mood of his quick-darting mind; teaching some great truth by a familiar phrase of the market or the workshop, by some sharp nickname borrowed from the talk of the street; taking, in short, the word or phrase that will best serve his turn, no matter whence it comes—from the playhouse or the pulpit, from an old Scotch ballad or the day's newspaper, from his native Annandale or from distant Hindustan. Hence his words have not only laid hold of his readers with a grasp there is no resisting, and spread like leaven through the literature of our time, but have done more than the writings of any other man to hasten the day when Coleridge's feeling of "the wonderfulness of prose" may become universal, and our poetry expand into a literature blending together all that is musical in verse and all that is facile and powerful in ordinary language. He has told the poetasters, the windy wordspinners, whose ideas are too thin and too fantastic to stand by themselves without the aid of rhythmical props, that the time for such peevishness is past; and to his example we owe it, more than to any other influence, that not a little of the very best poetry of this generation is to be found, not in books whose authors were hedged round by the limitations of verse, but in books of simple prose.

One of Edward Irving's predictions he fulfilled by revolutionizing two departments of literature, those of biography and history. Hardly one thing has been said by any critic about Carlyle without the very opposite being asserted by some other writer. "Feebleness in any form, even the feebleness of innocence," says one of our young poets, "was beyond the sphere of Carlyle's affection." "I believe," wrote Leigh Hunt, "that what Mr. Carlyle loves better than his fault-finding is the face of any human creature that looks suffering, and loving, and sincere; and I believe, further, that if the fellow-creature were suffering only, and neither loving nor sincere, but had come to a pass of agony in this life which put him at the mercies of some good man for some last help and consolation towards his grave, even at the risk of loss to repute and a sure amount of pain and vexation, that man, if the groan reached him in its forlornness, would be Thomas Carlyle." It was to Hunt a perennial delight to expatiate on what he happily designated "Carlyle's paramount humanity." Everything that he has written, save some unhappy oburgations about "the nigger," bears the impress of this humanity; and it was from this source there flowed one of his crowning merits as a biographer and an historian—a breadth of sympathy such as no previous writer in the same department of literature had exhibited, and which, happily, has profoundly influenced every subsequent worker in the same fields. It has long been the fashion to praise the cold impartiality of a Hallam, as if a history that throbs with life must be full of lies; but safely may we venture to affirm that the warm, impetuous, and even passionate Carlyle has been more successful in ascertaining the truth about authors and their books—that we come to him with more confidence than to the most "judicious" Hallam for a strictly accurate estimate of personal character and of literary worth. His profound humanity bred a patient care in elucidating facts, and in assigning to each its proper value, which the cold-blooded philosophers never troubled themselves to exercise. With

equal solicitude he marked the motive of the actor and its outcome. Without sympathy it is impossible for any man to form a right estimate of his neighbour; and this applies to literature quite as much as to life. In the private journal kept by Carlyle at Craigenputtock in 1829, we find him writing:—"He who would understand England must understand her church—for that is half of the whole matter. Am I not conscious of a prejudice on that side? Does not the very sight of a shovel-hat in some degree indispose me to the wearer thereof? Shut up my heart against his? This must be looked into. Without love there is no knowledge." The last sentence indicates the motive-power which more than aught else made its writer the force he became in English literature. By the commanding power of sympathy he achieved wonderful results. "The figures of most historians," says Lowell, "are only dolls stuffed with bran;" but Carlyle's, if you pierce them, they bleed. He has found something to love and esteem in the most diverse characters. No other writer has produced so many original estimates of character, going right in the teeth of the commonly accepted view; and not in one instance has he failed to gain for his novel estimate the suffrages of mankind. It was he who taught Scotland the real worth of Burns, which not even the poet's amiable biographer, the kindly and well-meaning Currie, had fully perceived, and which native writers of such high distinction as Scott and Jeffrey had failed to realize. It was he who restored to England the lost image of her greatest ruler, Oliver Cromwell; and for his own country he recovered the genuine features of John Knox. It was he who first rendered justice to poor Boswell, to whom it was so difficult to render justice, upon whom Macaulay had poured the cold douche of his heedless satire, and of whom his own kindred were foolishly ashamed. And it was Carlyle, too, who drew the most appreciative picture of Dr. Johnson, a man most unlike himself; recognizing in his case, as in Boswell's, the noble elements that were so easy to overlook, so certain to be ignored by all but the most generous natures. Macaulay sneered at Carlyle's "oddities of diction," telling Jeffrey that he "might as well write in Irving's unknown tongue at once;" but Carlyle was incapable of Macaulay's verbal trifling, and if we compare their respective portraits of Boswell, we shall find that it was Macaulay who indulged in foolish paradox, and that Carlyle had the greater integrity of purpose, more sobriety of mind, a keener insight, and a more independent judgment. His conclusions are based not merely on the intuitions vouchsafed to a vivid imagination, but on the result of a painstaking inquiry into all the facts that might have put to shame the most laborious Dryasdust.

It was Carlyle who first interpreted the literature of Germany to the English people. When a remark to this effect was made in the leading French reviews at the time of his death, the *Quarterly* pool-pooled the idea as preposterous. Had not Coleridge translated "Wallenstein?" Had not Scott and Shelley published a couple of kindred translations? were not "Pizarro" and "The Stranger" acted on the English stage? Above all, had not Lord Byron dedicated his "Sardanapalus" to Goethe? "Surely," said the *Quarterly* reviewer, "Goethe needed no further introduction from Carlyle." It is amusing to observe that this critic does not know the main point even of his own case, for he seems never to have heard of old William Taylor of Norwich, who was toiling in the field of German translation when Carlyle was in the cradle at Ecclefechan, and who had done something in those closing years of the eighteenth century, and still more in the opening quarter of the nineteenth, to reveal to cultured Britons the mine of intellectual wealth that lay awaiting them in the regenerated literature of Germany. But the best proof that these translations had made but the faintest possible impression in this country, and that the German mine

remained practically sealed to us, is to be found in the fact that Jeffrey, in his article on "Wilhelm Meister," poured contempt upon the whole race of modern German authors as a set of vulgar fellows quite unworthy the attention of the polite society of England. Such was the estimate the most accomplished reviewing expert in Britain had formed of the greatest and most spiritual literature in modern Europe when Carlyle was beginning his work of translating that literature into the English tongue. The essays from the "obstinate fellow" at Craigenputtock enlightened the editor of the *Edinburgh* about more subjects than Robert Burns. Goethe himself had the clearest perception of how the case really stood. With unerring instinct he saw that this young Scot in the wilds of Galloway was to be his interpreter to the English-speaking nations of the world; nor was it merely on his own account that he hailed Carlyle's advent with grateful joy, for he likewise saw that German literature would now at length have full justice done to it in England by an interpreter kindred in spirit to those great and original thinkers of the Fatherland, who were, as they remain to this hour, the foremost in Europe. Carlyle, then, beyond all question, was the pioneer of German literature in England—the first to open up to us the treasures of the magnificent store-house of wisdom in which he had found a solace and a satisfaction—the light and the leading—which the conventional literature of his own country was unable to furnish.

Any review of Carlyle's influence on literature would be incomplete which neglected to note how profoundly he deepened and spiritualized the tone of our popular thinking and writing. It has been thought by some that he dealt rather hardly with Scott and Byron; but the ground of his objections to them was good. The want of earnestness and spirituality—and more especially the theatrical affectations of Byron—he could not tolerate; and how powerfully his protest, backed by his example, has told upon our age we see when we compare the literature of to-day with that which was current in the first quarter of the century. Then form seemed everything; the spirit was reckoned nothing. A teller of pleasant stories was the greatest literary figure of the epoch; a shallow coxcomb its greatest poet. Jeffrey, sitting upon Wordsworth, was chirping out, "This will never do." John Foster was getting an audience only in the serious middle-class strata of the English Puritans. Sydney Smith was sneering at "consecrated cobblers" who madly dreamt of converting India to Christ. How different the spectacle we behold to-day! Even the novelist has become, in cases not a few, an effective teacher of the highest truth; for Byron and Tom Moore we have Browning and Tennyson; the quickening discourses of a Frederick Robertson, streaked with his life-blood, have taken the place of the cold and half-pagan moralities of Blair; in the room of a materialistic Priestley there is the spiritual Martineau; for the flimsy and partly forgotten religious manuals of forty years ago, we have a stream of vital aids to thought and devotion pouring from the press every day; and even the popular scepticisms, ashamed of the coarse and cold-blooded rivalry of Voltaire and Paine, are expounded in the accents, and sometimes with a close approximation to the spirit, of faith.

That Carlyle should have made a profound impression on the life, as well as the literature, of his age necessarily follows from the fact that he is above all things a moral teacher. So long ago as 1837, Goethe remarked to Eckermann that he saw in Carlyle a moral force so great, that he could not tell what he might produce. "His guiding genius," says Emerson, "is his moral sense, his perception of the sole importance of truth and justice; but that is a truth of character, not of catechism." Of one of his books that pure and intensely earnest spirit, Frederick Maurice, declared that it had done him a greater spiritual service than any other work he ever read; and similar testimonies have

been given by many others of the brightest leaders of our time, who have all felt the magic of Carlyle's stimulating touch. He is not merely a superb literary artist, not merely a philosophical inquirer standing in cold isolation apart from the interests and the struggles of contemporary life; but a moral and political instructor, who earnestly addresses himself to the task of solving the burning questions of his day. It was the most eminent of his merits that he clearly apprehended and ardently embraced the function of the teacher and guide of his generation. He did not allow himself to be refined away into a mere maker of charming phrases, or even into the mere speculative thinker. From the very outset down to the last hour of his long and laborious life he was on fire, not only to ascertain what is true and right, but to have the right accomplished among his fellow-men.

That he made mistakes in his teaching must be owned by his warmest admirers. His life-long battle with dyspepsia, which did so much towards making him, as he himself phrased it, "one of the saddest of all the sons of Adam," confirmed and exaggerated, sometimes to almost monstrous proportions, unpleasant and weakening tendencies that were strong in the Carlyle blood. His piercing insight added to his burden; and in the midst of the chaos which he wished to see reduced to order, he often became hopeless, impatient, and angry. But it is a comfort to observe that his aberrations produced no permanent effect. Slavery went down in spite of his Niagara rhapsodies; and constitutional government was never so strong in this and other nations as it is at the present hour. What was really sane and vital in his political teaching, while it warns us of the dangers besetting democracy, will never give comfort to an indolent, privileged aristocracy or lengthen the lease of the despot. Even his worship of Heroes, when rightly interpreted in the light of all that he has written, will not tend to make any honest and sincere reader of his works substitute genius for God. If the conqueror Frederick engaged more of his admiration than most honest men will be disposed to share, it was an admiration that waned the better he got to know his subject; and he ended the book by calling it the "Life of Frederick, called the Great." Carlyle really recognized no greatness that was not allied with goodness. "Voltaire," he says, "was not the wisest of men, because he was not the best;" and this truth he was perpetually reiterating, that "the thinking and the moral nature are but different phases of the same indissoluble unity—a living mind." The occasional harshness of his diatribes was abnormal, and indeed in manifest contradiction to the main current of his writings; his "French Revolution" was never so truly described, as when it was called "a monument to pity." The reader who has insight will see sympathy under his sarcasm, tenderness at the root of his indignation; his sardonic laughter was but another form of weeping, the outcome of that humour but for whose kindly relief the greatest spirits would find it scarcely possible to live. Nor should we forget that he was the iconoclast mainly in his conversation, and that the hard, aggressive element in his character was pushed to the front in oral criticisms of literature and politics. A spirit of contradiction was a family trait, and when he sneered at a wonderful meteoric display as "sulphuretted hydrogen, or some rubbish of that sort," or at Earl Russell in the midst of the Irish troubles as resembling "a canary whistling in a thunderstorm," or when he hurled a volley of invectives at the entire medical profession as "of all the sons of Adam the most eminently unprofitable—a man might as well pour his sorrows into the long hairy ear of a jackass"—every sensible listener felt that it was but word-play, only a very dull person would take it seriously. And, in fact, he was wont to say much worse things of himself than he ever said of other men. The blots on his teaching and his

life sink into insignificance when we contemplate the wholesome work he has done in penetrating ingenious souls with a regard for realities, with practical reverence for truth and justice. What professedly religious teacher has realized half as vividly, or taught with a title of his impressiveness, the sacred character of work—work which, even in its humblest forms, must be all wrong, he teaches, unless performed in the Great Taskmaster's eye. By his own simple life he taught men of letters to be independent of circumstances. He was so true to his work that, like Agassiz, he had not time to make money; and he performed a signal service to his age by the stern contempt which he poured on "the terror of not succeeding." No contemporary author dealt such fatal blows at materialism; and were all that he has written on the subject of religion brought together, it would be seen that no man since John Knox has more faithfully interpreted the essential spirit of Scottish Puritanism than the biographer of Oliver Cromwell.

Carlyle died at Chelsea on the 5th of February, 1881, in the eighty-sixth year of his age.

CARMAGNOLE, LA, the terrible song and dance of the French Revolution. It arose out of a kind of song-dance attributed to Carmagnola, a village in Piedmont, the home for centuries of street musicians. The tune of this particular Carmagnole, which has so evil a reputation, is Provençal; the musician Grétry ("Mémoires") heard it in his youth in Marseilles. When France was at the last pitch of exasperation through the continual use of the king's veto, and the celebrated march of the Marseillaise to join the feast of the federation in Paris took place (July, 1792), some one, perhaps spurred on by the success of Rouget de Lille's immortal "Marseillaise" hymn, put revolutionary verses to the favourite song-dance of the Carmagnole. They begin thus, alluding to the events just touched upon—

Madame Vêto avait promis
De faire égorger tout Paris,
Mais son coup a manqué,
Grâce à nos canonnières.
Dansons la Carmagnole!
Vive le son, Vive le son du canon!

The song became most popular with the extreme revolutionary mob, and to its accompaniment they danced. "Some ghastly apparition of a dance-figure gone raving mad arose among them. No fight could have been half so terrible as this dance. It was so emphatically a fallen sport—a something once innocent delivered over to all devilry—a healthy pastime changed into a means of angering the blood, bewildering the senses, and stealing the heart" (Dickens). The famous scene in the Convention, 20th Brumaire, year 2 (10th November, 1793), when the mob arrived from St. Denis clad in the priests' vestments, and drinking and eating off the communion plate, of which they had rifled the sanctuary, and insisted, though "Danton gloomed considerably in his place," on dancing the Carmagnole in the parliament-house itself—nay insisted, too, that members should join in the fury—will be in the memory of all readers of Carlyle's "French Revolution." At one time it was customary to sing and dance the Carmagnole round the guillotine, and fiercer words were added from time to time. So favourite was this name, that the typical revolutionary costume was universally called the "carmagnole complete"—blouse, tricolour girdle or waistcoat, and red cap; and the wearers of this, or they who by their speeches or actions seemed to approve of those who wore it, are often denominated "des vrais carmagnoles" in the memoirs of the time.

CARMARTHEN (in Welsh, *Caeŷfyrddin*), a county of South Wales, bounded N. by Cardigan, E. by Brecon, S.E. by Glamorgan, S.W. by the sea, and W. by Pembroke. Its greatest length is 53 miles, and its greatest breadth

about 33. The area is 947 square miles (606,172 acres). The population in 1881 was 124,861.

Carmarthenshire partakes of the mountainous character which is general in Wales, but the elevation of the mountains is not so great as in some other counties, the most lofty being the Mynydd Dŷ, or Black Mountains, where the Van attains the height of 2600 feet. The climate is mild, but moist. The soil is stiff and poor in the uplands, and only affords pasturage for small cattle; but the rest of the county is well wooded, and in the south the soil is generally fertile. According to the official agricultural statistics published in 1885 it appears that there are 435,000 acres (or more than two-thirds of the entire area) under crops of different kinds. The area devoted to corn was 68,000 acres; to green crops, 11,000; to clover, 86,000; and to permanent pasture, 318,000. The number of cattle in the county amounted to 110,000, and the sheep to 200,000.

The principal river of Carmarthenshire is the Tywi, or Towy, which enters the county from the N.E., flows past Llandovery to Carmarthen, and enters the sea at Carmarthen Bay; it receives the Brân, the Gwydderig, and the Cothi. The other rivers of the county are the Taf, the Gwendraeth Vawr, the Gwendraeth Vechan, and the Loughor. Some of these rivers possess abundance of fish, but they are navigable only to a small extent. There are a few small lakes in the county. Carmarthenshire is well supplied with good roads. The South Wales Railway traverses the southern part of the county, and there are smaller lines branching from it into the interior.

The greater portion of the county is occupied by the Silurian formation. In the south, bordering upon Glamorganshire and the sea, is part of the great coal field of South Wales. The coal is chiefly what is called stone coal; the large coal of this quality is used for drying hops and malt; the small coal, called culm, for burning limestone. Towards the coast the coal is more bituminous. The coal-field of South Wales lies in a basin of mountain or carboniferous limestone, and the northern outcrop of this limestone crosses Carmarthenshire in a wavy line E. and W. From this limestone is obtained marble for chimney-pieces, stone for tombstones, and lime for manure. There are also some important lead-mines. The Old Red Sandstone, which rises from beneath the mountain limestone, occupies in the county only a comparatively narrow strip of the surface bounding the coal-field and the limestone district to the north. Clay slate and grauwaacke slate underlie the sandstone, and, rising from beneath it, occupy the rest of the county. Under the Redistribution of Seats Act of 1885 Carmarthen was divided into two single-member constituencies. It is in the diocese of St. David's. In the north the Welsh national characteristics in language and customs are still as clearly marked as in any part of Wales. At the time of the Roman conquest it was inhabited by the Demetæ. The traces of three Roman roads, of several encampments, and many early British remains, still exist. The ruins of Carreg Cenin and of Dynyvor castles are interesting relics of mediæval times. It was in Carmarthen that the extraordinary Rebecca riots had their beginning in 1843-44. For months bodies of men went through the counties of Carmarthen, Pembroke, Cardigan, and Brecon, destroying the toll-gates and committing all kinds of excesses.

CARMARTHEN (in Welsh, *Cae'r Fyrdwyn*), a municipal and parliamentary borough, the capital of Carmarthenshire, forming a county in itself, is 218 miles from London by the Great Western and South Wales railways, although only 190 miles in a straight line. It is situated on the N.W. bank of the river Towy, near where that river falls into Carmarthen Bay.

The name of Carmarthen enables us to identify it with the *Maridunum* (*Magdeborus*) of Ptolemy. In A.D. 70 a

Roman station is said to have been founded here, the site of which is supposed to be that subsequently occupied by the castle and its outworks. It became afterwards the residence of the princes of South Wales. At what time the castle of Carmarthen was erected is not known, but in the contests between the neighbouring Welsh chieftains for the possession of the district, and in the wars between the natives and the Anglo-Saxons and the Normans and English, it was a post of importance, and frequently changed hands; in these struggles it suffered much. In the time of Charles I. the castle was garrisoned by the Royalists, from whom it was taken by the Parliamentarians, and was probably dismantled shortly afterwards.

The situation of this town is very beautiful, and the inequality of the ground on which it stands gives it a striking appearance when viewed from a distance; but the streets are irregular and steep, and many of them narrow. The guild-hall is a large building raised on pillars, with a covered market underneath. A substantial bridge of several arches crosses the Towy. The parish church is a large plain building, with a square tower. It has recently been repaired, and a new Gothic church (St. David's), to which a chapel of ease is attached, erected. The dissenters have several places of public worship, and there are also a training college for Congregational ministers, an endowed grammar and other schools, literary and scientific institution, infirmary, &c. A lunatic asylum, for the reception of patients from the three adjoining counties of Carmarthen, Cardigan, and Pembroke, was erected near the town in 1865. The building is commodious, and arranged on the most modern principles, and the grounds are tastefully laid out. There is an obelisk to Sir Thomas Picton, who was killed at Waterloo, and a bronze statue to General Nott, who were both natives of the town. Sir Richard Steele is buried in the church. Carmarthen has some small manufactures of flannel, rope, and leather, and shipbuilding yards for vessels of light burden; and near the town are some lead and copper mines. A flourishing coasting trade (chiefly with Bristol) is carried on, the articles exported being slates, marble, grain, butter, and eggs. Vessels of 200 tons can sail up to the bridge. The port is a sub-port of Llanelly. The corporation consists of six aldermen and eighteen councillors, one of whom is mayor. The parliamentary borough, in conjunction with Llanelly, returns one member to the House of Commons. Its population at the census of 1881 was 30,436. The town of Carmarthen itself only contains 10,514 inhabitants. Merlin, the Welsh prophet, is reputed to have been born here in the fifth century. The Duke of Leeds holds also the title of Marquis of Carmarthen.

CARMEITES, one of the orders of mendicant friars. Their origin is very obscure, but it seems most probable that they were first established as an association of hermits on Mount Carmel by Berthold, count of Limoges, somewhere about 1156. Driven out by the Saracens, they were changed by their general, Simon Stock, into a mendicant order. They subsequently became divided into several branches, most of which survive at the present day in Roman Catholic countries. An order of Carmelite nuns was instituted in 1452, was reformed by St. Theresa in 1526, and is still very popular in Italy. The Carmelites maintain that the prophet Elijah was their founder, and claim the Virgin Mary, and even Christ himself, as members of their order.

CARMINATIVES, agents chiefly obtained from the vegetable kingdom, are employed to promote the expulsion of flatulence. Plants possessed of an aromatic principle, owing to the presence of a volatile oil, are employed to effect this end, which they sometimes accomplish even when applied to the external surface of the stomach, and much more certainly when taken internally. Instead of the plants in a raw or dried state, the oil is often extracted from them

by distillation; or a tincture, or even a distilled water, is formed from them, and administered under similar circumstances; and this last mode is in general the best.

The safest and most effectual means of avoiding the distressing symptoms attendant on the disengagement of flatus are great attention to diet and regimen. Regular exercise should be taken daily. The food should be plain; soups and much liquid, particularly tea, should be avoided, and the person should retire to rest at an early hour.

CAR MINE, one of the most beautiful of the red colours used by painters. It is obtained from cochineal, from which this colouring matter, called *carmine* or *carmine acid*, is extracted by boiling water. Its formula is $C_{14}H_{14}O_8$. It is soluble in water and alcohol; it dissolves in sulphuric acid without alteration, and forms red precipitates with the alkaline earths and many of the metals. The purity of the tint depends much on its being precipitated in bright daylight. It was formerly very expensive, but its value has been considerably affected by the discovery of aniline colours. See COCHINEAL.

CARNAC, a village in the department of Morbihan, in France, about 9 miles S.W. of Auray. It is noted for some curious ancient groups of stones, situated about three quarters of a mile from the village, on a wild barren plain on the sea-shore. The stones are rough obelisks of granite, as a rule standing on their smaller ends, rising in some cases to a height of 18 feet, though a large number do not exceed 3 feet. They probably amount in number to as many as 11,000 or 12,000. There are altogether three great groups or systems, of which the most important is that of Maenac. It consists of eleven lines of maenhirs, or standing stones, some of which are 18 feet in height and as many in circumference. The circle in which it ends is not very distinct, as there are some houses among the stones; it is about 300 feet in diameter. N.E. of this, at the mill of Kermario ("Place of the Dead"), another group begins to be perceptible. They gradually assume a distinct arrangement into eleven ranks, some of the stones attaining a height of 12 to 16 feet. Beyond this group is that of Kerlesant ("the Place of Burning"), which becomes, as in the former groups, defined into eleven ranks of stones, 10 to 12 feet high, and terminates in an inclosure called Le Bal, which is bounded on the N. by a long barrow, on the W and S. by a wall of upright stones about 6 feet high, placed near together, and on the E. by the eleven ranks of maenhirs. The whole monument is a little under 2 miles in length. The stones are composed of the granite of the district.

CARNARVON (in Welsh, *Caer-yn-Arfon*), a county in North Wales, washed by the sea on every side, except the E. and S.E., where it is bounded by Denbighshire and Merionethshire. The greatest length is about 55 miles, and the greatest breadth about 22 miles. The area is 579 square miles (370,273 acres). There is a small detached portion of the county on the N. coast of Denbigh. The population in 1881 was 119,349. There are no remarkable headlands, except Great Orme's Head, near the mouth of the Conway. Penmaen Mawr, a lofty mountain, rises abruptly from the beach, between Conway and Bangor; the highroad winds along its side. Much of the shore is low and sandy, and some of the sands encroach on the N.E. and S.W. entrances of the Menai Strait, which divides the county from Anglesey. The southern coast has many irregular headlands. The county is traversed from N.E. to S.W. by a range of mountains, which are among the loftiest in Britain. It has three summits above 8000 feet in height; one (Snowdon) is 8557 feet, and several others range from 1000 to 8000 feet.

From the small size and peninsular form of this county, and the consequent nearness of the mountains to the sea, the rivers are small, though very numerous. Many of them rise from or expand into lakes, which bear the general native

name of *Llyn*, lake or pool. The Conway takes its rise from Llyn Conway, a lake about a mile in diameter; it receives in its course many minor streams, among which are the Serw, the Clettwr, the Avon Hwch, the Machno, the Lleder, and the Llugwy, and flows into the Irish Sea under the walls of Conway Castle. It is a tidal river, and is navigable 10 miles above Conway. The Glaslyn rises from the Ffynnon Las, flows through a very beautiful country, and empties itself into Carnarvon Bay. The Gwrfai, the Seiont, and the Llyfni take their rise on Snowdon. The Seiont flows through the two lakes of Llanberis, which are deep and embedded between two huge cliffs. The Ogwen rises on Mount Trevaen. There are many fine cataracts on these streams.

The climate is mild in the peninsular part of the county, but severe among the hills. The chief branch of rural industry is the rearing of black cattle and of small sheep, and, in some of the higher lands, of small ponies. Wheat, oats, barley, and potatoes are grown in the valleys.

According to the official returns published in 1885, there were 187,000 acres (or about half of the entire area) under cultivation. Corn was grown on 21,000 acres; green crops on 89,000; clover on 32,000; and 124,000 acres were devoted to permanent pasture. The number of cattle in the county was 50,000; and of sheep, 200,000. A great quantity of butter is made for distant markets, but there are no considerable manufactures.

The greater part of the county is in the diocese of Bangor. The Chester and Holyhead Railway skirts the northern margin of the county, close to the Irish Sea, and the Conway and Menai Strait are crossed by two stupendous tubular or tunnel bridges, devised by Robert Stephenson.

Along part of the coast of the Menai Strait there is a narrow slip of carboniferous limestone, which also forms the Great and Little Orme's Head. A narrow belt of rocks, continually varying in composition, skirts the carboniferous limestone on the land side. Within this is the Old Red Sandstone, which extends along the coast beyond the limits of the limestone, on the N.E. from Bangor to Conway, and on the S.W. to beyond the point where the Menai Strait opens into the Bay of Carnarvon. The other parts of the N.W. coast, the plains from the shores to the foot of the mountains, and the banks of the Conway, are occupied by argillaceous schists, comprehending clay slate and grauwacke slate; and other primitive rocks subjacent to this form the summits of the mountains. The greater part of the rocks composing the Carnarvon mountains are schistose hornblende, schistose mica, granite, and porphyry, including considerable blocks of quartz. There are also basaltic columnar masses in some parts.

There are copper-mines at Great Orme's Head, in the vale of Conway, a little west of Llanrwst, in the vale of Llanberis, and near Port Aberglaslyn. Lead and calamine are obtained in the vale of Conway, near the junction of the Llugwy with the Conway, and in that part of the county which lies east of the Conway. Millstones are dug in the vale of Conway. Slates are found in various parts of the county, and form one of the chief articles of export. The finest are those on the west side of the ridge of the Snowdonian mountains, and they become finer as they descend towards the sea. Not only roofing-slates and writing-slates are procured from these mines, but inkstands and other fancy articles are made. Slabs are procured large enough for tombstones and paving slabs.

Nearly all the inhabitants speak Welsh. Under the Redistribution of Seats Act of 1885 the county is divided into two single-member constituencies for parliamentary purposes.

The Romans crossed this county, under Suetonius Paulinus, when they attacked Mona (Anglesey), about A.D. 59. The Ordovices (the tribe of Britons who inhabited Carnarvon at that time) were not, however, subdued till the time

of Agricola, who nearly extirpated them about A.D. 78. In the "Itinerary" of Antoninus two stations within this county are given—*Segontium* and *Conorion*, near Conway, where Roman bricks have been found inscribed "Leg. X.," and the foundations of buildings discovered. In the division of the territories of Rhodri Mawr, or Roderick the Great, between his sons (A.D. 877), Carnarvon formed part of the kingdom of Gwynedd (the Roman *Venedotia*), or North Wales. This country formed the last stronghold of the Welsh princes, but it was finally subdued by Edward I. in 1283.

CARNARVON (in Welsh, *Caeu-gu-Arfon*, the town or fortress in Arfon), the county town of Carnarvon, is situated on the Menai Strait, 217½ miles from London by the London and North-western Railway.

The remains of the Roman station *Segontium* ("Itin. Anton.") are about a mile from the town, and consist of some fragments of the wall.

The present town of Carnarvon is probably the representative of the native town, which was adjacent to the Roman station. The situation appeared to Edward I. a favourable one for erecting a fortress to curb his newly conquered subjects, the Welsh. In 1282 he commenced the building of Carnarvon Castle, and its erection appears to have occupied twelve years—the revenues of the archbishopric of York (which was kept vacant for a time to serve this turn) being appropriated to defray the cost. The walls of *Segontium* furnished a part of the materials. The first Prince of Wales, afterwards Edward II., was reputed to have been born in this castle, though this is said to be impossible, as the walls were then hardly in existence. During the civil wars of Charles I. it was more than once taken and retaken by the Parliamentarians and Royalists.

Carnarvon occupies a peninsula formed by the Menai Strait on the north and west sides, and the Seiont on the south. The town is walled; the walls have round towers, and had originally only two gates; other openings have been subsequently made to form a communication with the suburbs on the east, which have so far increased as to make a new town. The streets are regularly laid out, crossing at right angles, and are well paved. The quay is on the south side of the castle, extending along the Seiont.

The town-hall is over one of the ancient gates. The county-hall, in which the assizes are held, is a commodious building, and the county gaol is part of the castle. There are baths erected by the Marquis of Anglesea, which include a spacious swimming bath. The museum adjoins the baths. There are several churches. The market-house is of modern erection, as are also two Llandudno Welsh Presbyterian churches. The North Wales Normal Training College is a very convenient building, with plain exterior, erected in 1858. There are also eight or nine dissenting places of worship, in most of which service is carried on in Welsh. The water-works were opened by the Prince and Princess of Wales in 1864. The water is procured from Quellyn Lake, 7 miles distant, and the supply is ample for double the present population.

The external walls of the castle are nearly entire, enclosing a space of 3 acres, of an oblong shape; they are from 8 to 10 feet thick, and have within their thickness a covered gallery with loopholes for the discharge of arrows. There are in the circuit of the walls numerous embattled towers with turrets. The interior is much dilapidated.

The town has no manufactures of any importance, but there is an extensive brass and iron foundry; and a considerable coasting trade is carried on with Liverpool, Bristol, London, and Ireland. There is also some foreign trade. The imports are principally colonial produce and the manufactures of Liverpool and Manchester, corn, timber, coal, &c. The exports are copper and slate from the Llanberis quarries. The port has been much improved, and admits vessels of 400 tons burden. The number of ships regis-

tered as belonging to Carnarvon in 1883 was 400 (50,000 tons); the entries and clearances annually average 2200 (170,000 tons). Carnarvon is resorted to as a bathing-place, and many families of rank reside in the neighbourhood, which contains some of the grandest scenery in North Wales.

Carnarvon received the first royal charter which Edward I. granted to Wales. By the Municipal Reform Act the borough of Carnarvon is divided into two wards, and is governed by six aldermen (of whom one is mayor) and eighteen councillors. The population in 1881 was 10,258. Carnarvon, in conjunction with Pwllheli, Nevin, Criccieth, Conway, and Bangor, sends one member to Parliament. The total population of the entire district in 1881 was 28,891.

CARNA'TION, a kind of dianthus or pink, a variety of the *Dianthus caryophyllus* of botanists, much esteemed by florists for the beautiful colours of its sweet-scented double flowers. It is usually grown in rich light loamy soil, in which sand enough is mixed to prevent water stagnating, and is propagated by either cuttings or layering. A great many varieties are cultivated, the most esteemed of which are those with a strong tall stem about 3 feet high, and regularly formed flowers with the stripes or markings clear, well defined, and broadest near the end of the petals.

CARNAUBA. See *COPERNICIA*.

CARNEADES, the Greek philosopher, the most illustrious of the "New Academy," whose tenets are so well known to us through Horace and Cicero, was born at Cyrene, in Africa, B.C. 213, and became a pupil of Diogenes the Stoic at Athens. This Diogenes is, of course, not to be confused with his notorious namesake the Cynic. He extorted the admiration of his master by his splendid paradox during a debate with him. "If I have reasoned rightly, O Diogenes, you are wrong; if not, I have been badly taught, and you should return me the *mina* I paid you for my lessons." After a study under Hegesinus, then principal of the New Academy, he adopted the sceptical philosophy, and himself succeeded to the chair in his turn. His doctrines are so similar to those of ANCEPS-LAUS, founder of the school, that the reader is referred for them to the article on the earlier master. In B.C. 155 he was sent with his old master, Diogenes, to Rome on an embassy. His skill in disputation, the Athenians thought, would serve them well, but this proved the very ruin of the embassy; for Carneades, urged on by the admiring Romans, harangued with splendid eloquence in praise of justice before Cato the Censor, whose full approval, so difficult to gain, he had the honour to receive. But the next day, his subject being the uncertainty of human knowledge, Carneades carefully overthrew one by one the arguments for justice which had seemed so weighty the day before; and the disgusted Cato did not rest till he had persuaded the senate to send back the too clever ambassador to his own country, lest Rome also should be corrupted. Carneades continued his long fight with the Stoics to the age of ninety. He was much beloved, though of a somewhat hasty temper.

CARNELIAN. See *CORNELIAN*.

CARNIVAL or **CARNEVAL**, from the Latin *car-nelera-men*, a solace of the flesh, a Low Latin religious term for Shrove-tide, made up from *car-nem*, flesh, and *leramen*, solace. The old Italian spelling, as in an extant document of 1130, was *car-nelera-le*. The shortening to *carnevale* was doubtless assisted by the popular and incorrect derivation from *car-nē vale*, farewell, flesh! It is properly a season of feasting, dancing, masquerading, and buffoonery, confined to Roman Catholic countries, which lasts for a few days, ending on Ash Wednesday, when it is succeeded by the austerities of Lent.

The Roman Carnival, according to the testimony of contemporary writers, appears to have reached its most

splendid development in 1584-1549, when Rome overflowed with the tributary wealth of all Christendom. Prior to this their chief characteristics had often been ostentation, magnificence in dress, and cruelty to animals. The popes in many instances were the chief patrons—Paul II. being distinguished in this respect—though it is customary for church writers to represent the contrary, and to point out the penances, mortifications, &c., ordered by way of atonement. The municipal authorities of the city now allow ten days for carnival, and have repressed many of its offensive and mischievous features.

Venice—which once vied with Rome as the home of carnival—Turin, Nice, Milan, Florence, and Naples, each at present put forth a festive programme in competition with Rome. Formerly the fun was spontaneous, but the gaiety has now nearly departed. The municipalities hire the buffoons and pay for the triumphal cars, and beyond a little pelting with confetti from the balconies, the public takes but little part.

CARNIVORA is a term applicable to any creatures which feed on animal substances, but is now restricted to a group of MAMMALIA which prey upon animals.

Cuvier included in this order, which he called *Les Carnassiers*, the Cheiroptera (BATS), and the INSECTIVORA (as the shrews, moles, &c.), regarding them respectively as merely families. Naturalists, however, now consider them as distinct orders, and apply the term Carnivora as the title of an order to the bears, dogs, cats, &c., which constitute so many families.

The Carnivora are usually divided into three great sections:—1, Arctoidea (bear-like animals); 2, Cynoidea (dog-like animals); 3, *Æluroides* (cat-like animals). The first section is subdivided into four families:—1, Ursidæ (BEAR); 2, Procyonidæ (RACON, &c.); 3, *Æluidæ* (PANDA); 4, Mustelidæ (weasel, polecat, &c.). Cynoidea only contains one family, CANIDÆ (dog, wolf, fox). The section *Æluroides* contains three families:—1, FELIDÆ (cat); 2, Hyenidæ (HYENA, AARD-WOLF); 3, VIVERRINÆ (civet, ichneumon, &c.). The first two Plates are devoted to the section *Æluroides*. In the third Plate species of the three principal genera of the Canidæ are figured. The fourth Plate is devoted to the family Procyonidæ, together with a representative of the family Mustelidæ.

In the order Carnivora we have the thirst for blood at its highest degree of development, and with it the power and the instruments for gratifying the appetite. Four large, long, and distant canines, separated by the intervention of six incisors in each jaw (the root of the second of the lower incisors being a little deeper planted than the others); molars either formed entirely with cutting edges or constructed partly with blunt tubercles—these, with the powerful mechanism of the jaw in which they are set, present a most formidable apparatus for finishing the bloody task which the rest of the frame of the Carnivora is so nicely adapted for commencing and continuing. The more completely trenchant these molars are, the more completely carnivorous are the habits of the animal; and the different gradations may be in general safely traced by observing the proportional extent of surface, considered with reference to its tubercular or cutting shape. The bears, which, taken as a whole, may be said to be capable of supporting themselves on vegetables, have nearly all their molar teeth tuberculated. The molar teeth vary considerably in number, being twenty-six in the Ursidæ and only fourteen in the Felidæ. The last premolar in the upper jaw, and the first molar in the lower, are the "sectorial" or "carnassial" teeth, which have a sharp knife-like edge for dividing flesh. By observing these differences of dental form, the genera of Carnivora are most surely established, and it may be laid down as a general rule that those carnivorous animals which have the shortest jaw and the least development of molar teeth are those in which the sanguinary propensity and the destructive power co-exist in the highest degree.

Selecting the lion (*Felis leo*) as the type of the Carnivora, it will be seen on a reference to the skeleton (BACKBONE, Plate IV.) how beautifully its structure is adapted for the purposes of active pursuit, and for the employment of overbearing strength. The skull is short, broad, and massive, the hind part supporting the zygomatic arches. The object of these long ridges is to afford attachment to the powerful temporal muscles which act upon and are inserted into the base of the lower jaw. The orbital fossæ are spacious, in order to accommodate the largely-developed eyes. That part of the temporal bone immediately connected with the function of hearing is remarkably developed, for the purpose of exaggerating the power of appreciating the most delicate sonorous vibrations—a circumstance obviously connected with the animal's nocturnal habits. From the internal surface of the occipital and parietal bones a peculiar shelf-like bony plate projects, so as to divide the cerebral cavity into two or more parts; in the living state these bony plates occupy the narrow interspaces between the principal divisions of the brain, and they are evidently intended to protect the great nervous centre from injury, during the violent and oft-repeated shocks to which the animal's habits necessarily expose it. The vertebral column of the lion is amazingly strong, yet, at the same time, very flexible; this combination of strength and elasticity being particularly well seen in the bones of the neck, where the first two segments are remarkably enlarged, the transverse processes of the former and the spinous process of the latter also affording admirable support and attachment to those muscles which act upon the occiput. There are thirteen ribs, but the number varies in different genera. The skeletal elements of the fore limbs display evidence of great power. The scapula or shoulder blade is particularly broad; the upper end of the humerus, or arm-bone, is specially enlarged to give insertion to the strong muscles of the shoulder; the radius and the ulna, together with the bones of the carpus and metacarpus, are likewise correspondingly stout and powerful. In the lion and other digitigrade Carnivora—that is, those which walk on the tips of their toes—the ultimate digital phalanges are curiously modified for the support and protection of their terrible claws. The extremity of each phalanx is invested by the hooked nail, the base being also deeply grooved and hollowed out for the lodgment and fixing of its root. With regard to the posterior pair of limbs, the femora, tibiae, and fibulae do not exhibit any more remarkable features than those referable to an increased power; the calcaneum or heel-bone is bulky, and with the metatarsals directed vertically upwards. This arrangement facilitates the actions of springing and leaping. In the Carnivora the stomach is simple and the cæcum small or wanting. The brain varies much in size and form, but it is usually large and well marked with convolutions. Of all the senses that of smelling seems to be in the highest perfection. The intestines are comparatively short, as their food requires less elaboration than vegetables.

CARNOT, LAZARE NICOLAS MARGUERITE,

one of the principal figures of the French Revolution, was born at Nolay, in Burgundy, 13th May, 1753. He entered the engineer branch of the army in 1771, and in 1791 was elected to represent the Pas de Calais department in the Assembly, and became a member of the military committee. He was one of those who voted for the death of Louis XVI. In 1793 he became a member of the committee of public safety; but he appears to have confined himself almost entirely to military affairs, and was in truth the war minister of the committee. In 1793 he joined the army of the north, and was mainly instrumental in gaining the victory of Watignies. In 1795 he was elected for seventeen different places, but was shortly afterwards proscribed, and sought refuge in Germany. He was recalled

by the first consul, and was made minister of war, but had to resign that office when he voted against conferring the consulship on Napoleon for life. After the Russian campaign, when France was on the eve of invasion, he offered his services to Napoleon, and received the command of Antwerp, which he held until the abdication of 1814. When Napoleon returned from Elba he was again appointed minister of war. After the restoration he retired first to Warsaw, and then to Magdeburg, where he died, 2nd August, 1823. He was twice a member of the Institute, and twice expelled—the first time by the Directory, and afterwards on the restoration of 1814.

He published several works on fortification and mathematics. He also published some political tracts, and in particular, a justification of his public conduct in 1815.

CAROB TREE (*Ceratonia Siligua*). St. John's Bread, is a remarkable plant, found wild in all the countries skirting the Mediterranean, especially in the Levant. At Malta it is almost the only tree that grows, relieving the irksomeness of the whitestone inclosures by its dark foliage. It belongs to the order LEGUMINOSÆ. The pods contain a sweet nutritious pulp, and are sometimes seen in fruiterers' shops; they are a common article of food in the countries where the tree grows wild. It has obtained its name of St. John's Bread from its being supposed to be the tree which yielded the honey eaten with the locusts by St. John in the wilderness, or, as others put it, the sweet pulp of the pods is the "honey" and the young tender shoots are the "locusts." The shell of the pod may well have been the "husks" which the "prodigal son" would fain have eaten.

This is the only species of the genus *Ceratonia*. It is a small evergreen tree, with a thick trunk. The flowers are in small red racemes; there are five tooth-like sepals; no petals; a flat peltate disc; five stamens; a long thick pod, which does not open; numerous seeds with copious albumen, separated from one another by the pulp.

CAROCIO, the great standard-wagon of the early Florentine republic. Just as in the well-known "battle of the Standard," fought near Northallerton in 1138, where a ship's mast rising from a wagon bore the standards of St. Peter of York, St. John of Beverley, and St. Wilfred of Ripon, and gave courage and saintly protection to the English, so the Florentines used to go to war led on by their bullock-drawn scarlet *carocio*, from the top of whose masts floated the banner of "Our Lady of the Flower," the patron saint of Florence, and the lily-standard of the town herself. The *carocio* was taken by the Senese (aided by Florentine malcontents) in the battle of Mont' Aperto in 1260, and its masts were placed one on each side of the majestic choir arch of the cathedral, where they remain to this day. Not only were the Florentine standards torn from the wagon, trailed along the ground to the victorious city, but the battle bell, the *Martinella*, whose tongue gave the signal for the assault, was tied to the tail of an ass and dragged thither also through the dirt.

CARODOC or CARADOC SANDSTONE is of CAMBRO-SILURIAN age, and is exposed between Church Stretton and Caer Caradoc in Wales, whence it extends northward towards the Wrekin and southward to Corsten. It occurs about the same horizon as the Bala Beds, and contains many beds of interstratified volcanic rocks.

CAROLINA, NORTH, one of the United States of North America, extends from 33° 50' to 36° 30' N. lat., and from 75° 30' to 84° W. lon. Its extreme length, from near the source of the Tennessee River to Cape Hatteras, is 430 miles, and its breadth about 180. Its area is 50,704 square miles. It is bounded E. by the Atlantic Ocean, S. by South Carolina and Georgia, N. by Virginia, and W. by Tennessee. The population in 1880 was 1,808,519, of whom 531,277 were coloured.

The western portion of this state, which is somewhat more than one-fourth of its surface, lies in the Appalachian

Mountains, and is traversed by several of its ridges, of which the Blue Ridge forms the eastern portion. To the east of them extends the higher terrace, or the hilly country. Between this region and the coast spreads the lower terrace.

A tract of sand runs along the whole coast of North Carolina, which is indented by many sounds and bays. The inlets are shallow and dangerous, and Ocracoke is the only one through which vessels pass. Cape Hatteras and Cape Lookout are projecting points of the coast, and Cape Fear is on an island off the mouth of Cape Fear River.

The country for 60 or 80 miles inland is a dead level; the streams are sluggish and muddy, and there are many swamps, on which fine rice is grown. The soil is poor, except on the margins of the rivers. The western part of the state is an elevated table-land, about 1800 feet above the level of the sea, which contains some high ranges and lofty summits, among which Black Mountain is 6476 feet high. Between the sandy level and the table-land is a belt, about 40 miles wide, of moderately uneven surface, which extends to the lower falls of the rivers. This tract has a sandy soil, on which the pitch pine is the prevailing growth. Above the falls the country is uneven, the streams are rapid, and the soil more fertile, producing wheat, rye, barley, oats, and flax. In the low country grapes grow wild. Indian corn, tobacco, and cotton are grown in many places, as are also immense quantities of sweet potatoes. The climate in the low parts is hot and unhealthy in summer, bilious and intermittent fevers prevailing; but the middle and western sections are temperate and healthy. Wheat is harvested in June and Indian corn in September. The forests of pitch pine furnish large quantities of lumber, tar, turpentine, and resin. In some of the forests, in the more swampy districts, there is such a dense undergrowth of vines, briars, &c., as to be almost impassable. In the northern part of the state, and extending into Virginia, is the Great Dismal Swamp, 80 miles long and 10 wide. The state is traversed by several extensive rivers, all—with the exception of a few small tributaries of the Tennessee—running in a S.E. direction, and discharging themselves into the Atlantic, after courses of from about 200 to 400 miles. Commencing on the N.E. the Chowan and Roanoke rise in Virginia, and empty into Albemarle Sound. The Tar and the Neuse rise in the N. of North Carolina, and empty into Pamlico Sound. The Cape Fear River, the largest that has its whole course in the state, rises in the N., and empties into the Atlantic at the S. extremity of the state. The Yadkin and Catawba rise in the N.W., and pass into South Carolina, where the former takes the name of the Great Pedee, and the latter of the Wateree. The rivers of North Carolina are so obstructed by sandbanks at their mouths, and by rapids and falls further up, as not to be navigable for vessels of a large class. The Cape Fear is navigable to Wilmington, 40 miles, for vessels drawing 10 or 12 feet of water, and to Fayetteville for steamboats. Steamboats ascend the Neuse to Waynesborough, 120 miles. The Tar is navigable for steamboats to Tarborough, 100 miles; the Roanoke for small sea craft 30 miles, and for steamboats to Halifax, 120 miles; and the Chowan for steamboats 75 miles.

There are about 1200 miles of railway open in the state, and several canals, the most important of the latter being one cut right through the Great Dismal Swamp.

North Carolina has no manufactures of importance, but is the chief state of the Union for naval stores; it has a considerable export trade in its mineral productions, gold, copper, iron, and coal. In consequence of the obstructions at the mouths of the rivers already alluded to, by which the entrance of large vessels is prevented, its commerce is limited to the exports of its produce to the neighbouring states in coasting vessels.

The constitution of the state consists of a senate of fifty

members, a congress of 120 members, and a governor, whose term of office is of two years' duration. It sends eight members to the Union Congress and two senators to the Senate. It is divided into ninety counties, and its chief towns are Raleigh (the capital), Wilmington, and Fayetteville.

The first permanent settlement in North Carolina was made on the eastern bank of the Chowan by immigrants who had fled from religious persecution in Virginia about 1660. It adopted the constitution of the United States in 1789. It played an important part on the Confederate side during the civil war from 1861 to 1865. The two states of Carolina (North and South) were formerly known as the country of Albemarle.

CAROLINA, SOUTH, one of the United States of North America, lies between 32° and 35° 10' N. lat., and 78° 24' and 83° 30' W. lon. Its greatest length, from its E. angle on the Atlantic to its extreme W., at the junction of the Savannah and Chatuga rivers, is 275 miles, and its mean width nearly 120 miles. Its area is 34,000 square miles. It is bounded E. by the Atlantic, and on the other sides by Georgia and North Carolina. The population in 1880 was 995,437, of whom 604,332 were coloured.

South Carolina, like North Carolina, exhibits three different regions. The most western districts are covered with ridges of mountains and hills, which belong to the Appalachian system. East of this mountain range extends the hilly country.

The northern portion of the coast of South Carolina to Winyaw Point forms an unbroken line of low sandy shore. South of that cape the shores, though low, are divided by a great number of inlets, the mouths of rivers, which generally divide into numerous branches before entering the Atlantic Ocean, and by their many channels cut the shores into islands, the surface of which is very little elevated above high tides. The inlets dividing the islands, as well as the rivers, are comparatively very shallow. At two points only are there harbours suitable for large vessels. One place is Charleston harbour, which is formed by the junction of two small rivers, the Cooper and Ashley, the channel of which admits vessels of 16 feet draught. The other is Port Royal entrance, formed by the Broad River, the common estuary of some little creeks into which the tide ascends to a considerable distance.

The plain along the sea-shore, which extends about 80 miles inland, is a uniform level. At its western border it has a gentle and imperceptible ascent to about 200 feet above the sea. The soil is sandy and barren, but it is intersected along the rivers by fertile tracts, which yield rich crops, especially of rice. A portion is covered with numerous swamps and morasses, overgrown with heavy timber, such as oak, ash, and cypress. To the west of this plain stretches a chain of sandy hills, from 20 to 10 miles in breadth, beginning at the upper course of the river Pedee in North Carolina, and extending across the state to the banks of the Savannah. This tract produces nothing but small pine-trees and some shrubs, except in the narrow valleys, which are very fertile. Here the rivers form rapids. The country further west is broken into hill and dale.

The principal rivers are—the Pedee, the Santee, and the Savannah. The Pedee rises in the Blue Ridge in North Carolina, and is first called Yadkin. It flows generally S.E. till its junction with the Little Pedee, whence it flows S.W. to the port of Georgetown, at which place it is called Winyaw Bay, and forms a wide estuary. As far as its course is included in this state it is navigable for river boats. The Santee is formed by two great branches, the Wateree and the Congaree. It is navigable for boats of 70 tons burden to Camden, above which town are the Catawba Falls; but as the falls may now be avoided by a canal cut along the river, called the Wateree Canal, it may be ascended much higher, at least by river boats. The Savannah has its furthest branches in the western district

of South Carolina and the northern parts of Georgia, and forms, during all its course, a distance of 250 miles S.S.E. the boundary between both states.

The climate of the low plain is very hot in summer, but comparatively mild in winter. Snow seldom falls near the sea, and is soon dissolved. In the upper country snow and frost occur annually.

The principal objects of agriculture in the low plains are rice and cotton, the latter being also cultivated in some districts further inland. The sugar-cane is only grown with advantage in the most southern part of the state. The fruits of the sea-coast are oranges, lemons, pomegranates, olives, and figs. In the upper country all the grains and vegetables of England are grown, with Indian corn in addition. The forests contain fine timber-trees, especially oak, beech, and hickory.

The domestic animals are those of Europe. There are still found in the mountainous districts deer, bears, wolves, wild cats, foxes, raccons, opossums, and polecats. The wild turkey is pretty common in the upper country, and the wild pigeons come at certain seasons in great numbers. Many kinds of serpents are known, among which is the rattlesnake. Alligators abound near the head of the tide-water in the rivers, and grow to a great size.

No metal is found in large quantities, except iron, which is met with in several places in the upper country. A little gold is found, and some copper and lead.

The manufactures of South Carolina are unimportant, and confined chiefly to articles of primary necessity. Its commerce consists of large exports of cotton, rice, and lumber.

To facilitate internal commerce, short canals have been cut, especially to avoid the rapids of the rivers. The most important is the Santee Canal, which extends 22 miles from Charleston harbour to the Santee River. The state contains about 1300 miles of railway.

South Carolina is divided into thirty-one counties, and sends five representatives to the Union Congress and two senators to the Senate. Its principal towns are Columbia, the capital, Charleston, and Georgetown.

South Carolina was first settled at Port Royal, in 1670, by the English. A constitution for this colony was formed by the celebrated John Locke, somewhat on the plan of Plato's model republic, which, however, signally failed. In 1690, a number of French Huguenots settled in this state, and subsequently a number of Swiss, Irish, and Germans arrived. South Carolina had gone further than any other state in asserting the rights and powers of the sovereign states in opposition to the federal government, and was the first to secede in 1860. In 1880 more than three-fourths of the members of the state government were negroes, many of them having been slaves seventeen years before!

CAROLINE, QUEEN AMELIA ELIZABETH, wife of George IV., was the daughter of Charles William Ferdinand, duke of Brunswick, and was born on the 17th May, 1768. She was married to George (then Prince of Wales) in 1795, and gave birth to a daughter, the Princess Charlotte, in 1796. Within three months of this event her husband, who disliked her, obtained a separation, and the princess retired to a residence at Blackheath. About 1806 serious accusations were made against her, and with such publicity that the king appointed a commission to inquire into them; but after a rigid scrutiny she was acquitted of all guilt. In 1814 she went to the Continent, and lived chiefly in Italy until her husband succeeded to the throne, when, refusing certain money proposals which were made to her on condition of renouncing her title and staying abroad, she at once came to England to claim her rights. A bill for a divorce, on the alleged ground of her adultery, was then brought into the House of Lords by the king's direction; but the defence by her advocate, Brougham, was so telling, and the popular feeling in her favour so strong, that after passing

the House of Lords it was allowed to drop. Further indignity was, however, yet in store for the unhappy queen, for on her husband's coronation day (19th July, 1821), she was refused admission to Westminster Abbey. This is thought to have hastened on her death, which took place on the 2nd August following.

CAROTID ARTERY, the great artery on each side of the neck, which conveys the blood from the aorta to the head. They are called the carotid or "sleepy" arteries, because the ancients thought that an alteration in the flow of blood through them caused stupor (Gr. *karos*). The pressure in the carotids is very great, since they practically arise directly from the aorta itself, the right carotid of man beginning at the junction of the collar-bone with the sternum, arising from the innominate artery, and the left carotid arising from the arch of the aorta. The pressure on the walls of the carotid can be measured by means of a manometer, an instrument constructed on barometric principles; and it is found that the pressure in the carotid of a rabbit is equal to from 2 to $3\frac{1}{2}$ inches of mercury; in the dog, from 4 to $5\frac{1}{2}$; in the horse, from 8 to 12; and in man, about $5\frac{1}{2}$ inches. The velocity of the flow of the blood in the carotid of the horse averages about 12 inches a second, varying largely with the pulse, the rate at each pulsation being 20 inches, and that between the pulsations not much more than 6. Similarly, in the rabbit the rapidity of flow in the carotids varies from 8 to 1, and in the dog from 20 to 8 inches per second. Also the pressure, and hence the flow, is increased during inspiration and lessened during expiration.

Level with the thyroid cartilage in man ("Adam's apple") each carotid, hitherto called "common carotid," left or right, as the case may be, divides into the external and internal carotids of each side.

CARP (*Cyprinus*) is the typical genus of the Cyprinidae, a family of fishes belonging to the order *Physostomi*. In this family the body is generally covered with scales, which do not extend over the head. The mouth is small and devoid of teeth, and the upper jaw is entirely composed of the intermaxillary bones. The lower pharyngeal bones are well developed, and are provided with teeth, which are incorporated with the bones arising from them in one, two, or three rows, to oppose, by their crowns a cartilaginous or bony tubercle which is embedded in the basi-occipital bone. The stomach has no pyloric appendages. The air-bladder is divided by one or more narrow necks into successive chambers, the foremost of which is enased in a thick, soft, fibrous capsule, and is connected with the acoustic organs by chains of small bones; the second air-chamber communicates with the gullet by a long tube.

More than 100 genera are included in the Carp family. They are almost world-wide in their distribution, and are found fossil in great numbers in various Tertiary formations. They are more exclusively than almost any other large family, fresh-water fishes, though some species descend the rivers into the brackish waters of estuaries or inland seas. Most of them flourish and multiply in ponds. Their cultivation has been much attended to in China, whose teeming populations derive great quantities of food from this family of fishes. The Cyprinidae feed chiefly on aquatic plants and worms; a few are vegetarians. The following are the more important genera and species:—The Common Carp (*Cyprinus carpio*) is distributed through the northern part of Europe, and is also found in China and Japan. The name of the carp, though mentioned by Aristotle and Pliny, does not occur in Ausonius; and hence it is probable that at the end of the fourth century, when the Bordeaux poet wrote, the carp, which was originally a native of the East, had not reached the Moselle. It is not included in the ample list of fish served up at the feast held in 1456 at the enthronement of the Archbishop of York; but fifteen years later the priores of St. Alban's, Dame Juliana

Berners, in her "Boke of St. Alban's," printed in 1481, calls it "a deyntous fische." This passage was doubtless unknown to Leonard Mascall, who claims to have introduced carp and pippins into England in the year 1600. The suppression of the monasteries had probably caused the carp ponds to be neglected.

The Common Carp has an elongated thick body, covered with large scales. The upper part of the body is of a rich olive brown colour, darkest on the head; the under parts are yellowish-white, and the fins are brown; the ventral and anal fins are tinged with red. The head has a rounded blunt snout, and a narrow mouth furnished with four barbels. The pharyngeal teeth are arranged in three rows. The dorsal fin is long, with a strong serrated bony ray. The food of the carp consists of the larva of aquatic insects, worms, and water-plants. This fish can exist for a considerable time without food, often during the winter remaining for months buried in the mud without eating. It is capable also, like some others of its family, of sustaining life for a long time out of water. "Advantage is often taken of the circumstance," says Günther, "to transport them alive, by packing them among damp herbage or damp linen; and the operation is said to be unattended with any risk to the animal, especially if the precaution be taken to put a piece of bread in its mouth steeped in brandy." Carps grow very rapidly, and attain a considerable size, fish weighing from 30 to 40 lbs. being sometimes taken in certain lakes in Germany. Though a favourite victim of the angler, the food is not greatly esteemed.

The genus *Carassius* is distinguished from *Cyprinus* by the absence of barbels, and by the single row of pharyngeal teeth. It includes the Crucian Carp (*Carassius vulgaris*) and the Gold Fish (*Carassius auratus*). The Crucian carp is distributed over Central and Northern Europe, and extends into Italy and Siberia. It is a small species, and, according to Günther, is much subject to variation of form, the so-called "Prussian carps" being only very lean examples.

The genus *Catostomus*, containing the Suckers, is confined to the lakes and rivers of North America. The pharyngeal teeth are very numerous, and arranged in a single row. Barbels are absent. The dorsal fin is elongated, and opposite the ventral fins; the anal fin is short.

In the genus *Leuciscus* (roach, &c.) the dorsal fin is short, but without a bony ray. In the closely allied genus *Chondrostoma*, found both in Europe and Western Asia, the lower jaw has a cutting edge, covered with a brown horny layer.

In the genus *Rhodens* a long external urogenital tube, often two thirds as long as the body, is developed in the females during the spawning season.

The following genera are noticed elsewhere:—*Barbus* (BARBEL), *Gobio* (GUDGEON), *Tinca* (TENCH), *Aburmus* (BREAM), *Alburnus* (BLEAK), *Cobitis* (LOACH).

CARPACCIO, VITTORIO, an artist of the Venetian school of painting, but little esteemed in proportion to his merit until Ruskin made it his lifework "to teach, so far as in this hurried century any such thing can be taught, the excellency and supremacy of five great painters, despised until I spoke of them—Turner, Tintoret, Luini, Botticelli, and Carpaccio" ("Modern Painters," vol. ii. 1883 edition). Carpaccio flourished about 1500, but details of his life are very scanty. He was certainly living in 1519, as there are pictures so dated. He several times competed with the Bellini for church-painting at Venice; and his most important work was undertaken in conjunction with Bellini, in the council-chamber of the Doge's Palace. It was destroyed by fire in 1576. Without possibly sharing the enthusiasm of Mr. Ruskin, the lover of art cannot fail to be struck by the fine style of Carpaccio in the numerous examples of the master at Venice, more especially at the Accademia.

CARPATHIAN MOUNTAINS. See EUROPE, TRANSYLVANIA.

CAR'PEL. If the fruit of a peony, for example, is examined, it will be found to consist of two or more hollow bodies terminated by a stigma, and containing ovules; taken collectively these are called the pistil, and each separate body is a carpel.

CARPENTA'RIA, a great gulf of the Pacific Ocean, deeply indenting the N. coast of Australia. It is above 850 miles in extent both ways, and has low shores. It contains many islands, the chief groups of which are—Wellesley Islands, Sir Edward Pellew Islands, and the Groote Eylandt. The Mitchell, the Gilbert, the Flinders, the Leichhardt or Disaster, the Gregory or Albert, and the Roper, are rivers which discharge into the gulf. Its E. coast was discovered by the Dutch in 1606.

CARPENTER, DR. LANT, an eminent Unitarian divine, was born at Kidderminster, 2nd September, 1780. In 1805 he entered the ministry at Exeter, and commenced a school. In 1806 he received from the senate of the University of Glasgow the degree of LL.D., in testimony of his distinguished career as a student. While at Exeter he took an active part in promoting the establishment of public libraries, schools, the savings bank, and other institutions for the benefit of the city. In 1817 he removed to Bristol, where he showed the same ardour for the improvement of the people. The influence of his character, especially on the young, was remarkable; as a teacher he was in advance of the times in the scientific instruction he imparted. His numerous publications were chiefly theological, philosophical, and educational. The overstrain from his incessant labours obliged him more than once to retire for long periods from active service. On his last journey to restore his health he was lost at sea, off the coast of Italy, 5th April, 1840. A Memoir of his life was published in 1842, an abridgment of which was edited by his daughter, Mary Carpenter, in 1875.

CARPENTER, MARY, eldest child of Dr. Lant Carpenter, was born at Exeter, 1807, and removed with her family to Bristol in 1817. She was trained in her father's school, where her proficiency in classics and natural science soon enabled her to take part in the teaching, and she subsequently conducted a girls' school with her mother and sisters. She was thus concerned in education from her earliest years, while her thoughts were also directed to the condition of the poor by the events which culminated in the Bristol riots in 1831. Early in the following year she made a solemn resolve to devote herself to the good of her fellow-creatures, and this purpose was quickened in 1833 from two different quarters. Rajah Rammohun Roy came to Bristol, and inspired her with a deep interest in the people of India; and Dr. Tuckerman, formerly minister to the poor in Boston, U.S., spent some time at her father's house. The rest of Mary Carpenter's life was in fact the development of these two impulses. Out of her Sunday school work, under the influence of ideas communicated by Dr. Tuckerman, arose a Visiting Society, then a Domestic Mission, and next, in 1846, a Ragged School. Her experience there (embodied in a little book called "Ragged Schools, their Principles") brought her into close contact with juvenile crime, and forced her to reflect on the true methods of reforming young offenders; and in her "Reformatory Schools" (1851), and the companion volume, "Juvenile Delinquents" (1853), she urged the establishment of reformatory schools under legal authority. With the aid of Mr. Matthew Davenport Hill she organized the first Birmingham Conference on the subject (1851), and in the next year she gave evidence before a committee of the House of Commons. Without waiting for government aid she established a Reformatory for Boys and Girls at Kingwood; and in 1854, with the assistance of Lady Byron, planted a Reformatory School for Girls at Red

Lodge, Bristol, which remained under her sole charge till the day of her death. Further experience showed the necessity of an intervening class of schools, to rescue those just falling into crime, and the certified Industrial School was founded, near Red Lodge, in 1859. Other developments, a Children's Agent to look after vagrant children, a Workmen's Hall, and, some years afterwards, a Boys' Home, followed in due course from the Bristol work, while she was at the same time urging by repeated publications, parliamentary correspondence, and other means, the claims of Ragged Schools to government aid. A visit to Ireland gave her the opportunity of examining the prison system of Sir Walter Crofton, and an important treatise, entitled "Our Convicts" (two vols. 1864), set forth her views on prison discipline. The strain of these labours made some change necessary; and the visits of some Hindu gentlemen revived the long dormant thought of a journey to India. She went out in the autumn of 1866. Her attention was specially bestowed on Female Education, the need of Reformatory Schools, and the condition of the Gaols; and on all these subjects her views were laid before the government. The last ten years of her life were occupied with her numerous home and Indian interests. She thrice revisited India; her last journey being made in 1875-76, when her observations on the progress of Female Education were embodied in a report to Lord Salisbury. A bill for the establishment of Reformatory Schools was passed by the Indian government, and other questions concerning prison discipline were brought under its consideration by her. In 1873 she likewise visited America, where her addresses on prison discipline excited much attention. In 1876, at the proposal of Lord Sandon, Parliament sanctioned her plan for the establishment of Day Industrial Feeding Schools, under school boards, in place of the old Ragged Schools; and the series of institutions she had first sketched out was now complete. She died in her sleep, 15th June, 1877. Besides the works above named, she contributed numerous papers to the *Transactions* of the Social Science Association, of which she was from its foundation an active member. The impressions of her first Indian journey were recorded under the title, "Six Months in India" (two vols. 1868); and her "Morning and Evening Meditations" went through several editions. ("Life and Work of Mary Carpenter," by her nephew J. Estlin Carpenter, 2nd edit. London, 1881.)

CARPENTER, DR. PHILIP P., youngest son of Dr. L. Carpenter, was born at Bristol 4th November, 1819. After graduating at London, 1841, he engaged in the ministry, first at Stand near Manchester, and then at Warrington. He was remarkable for his enthusiastic labours, especially among the young and the neglected poor. He made conchological science one of the objects of his life, and his voluminous reports to the British Association (1856, 1863) on the mollusca of the west coast of America showed his wide range of knowledge and thoroughness of research. Having purchased a great collection of shells from Mazatlan, California, his careful examination of many myriad specimens led him to some important conclusions. He presented a collection of 8873 specimens, comprising 200 new species, to the British Museum, of which he printed a descriptive catalogue in 1857. During a tour in America he examined and arranged many public collections, and the University of New York made him its first Doctor of Philosophy. Among his numerous conchological works his treatise on the Chitons may be specified. In 1865 he settled in Montreal, and endowed its university with his valuable collections; there he spent the remainder of his life in teaching and in public labours, those for temperance and sanitary reform being most conspicuous. He died 24th May, 1877. His *Memoirs* (2nd edit. London, 1880) were edited by his brother, Russell Lant Carpenter.

CARPENTRAS, a town of France in the department of Vaucluse, is situated in a fertile territory at the foot of Mont Ventoux, on the left bank of the Auzon, 15 miles N.E. of Avignon; it has a civil tribunal, a communal college, and 9579 inhabitants. It is girt by walls flanked by towers, and pierced with four gate entrances exactly opposite each other; outside of these runs a broad esplanade, planted with trees. The houses are mostly well built, but the streets are often narrow and crooked. In the public squares are many fountains, from which an abundant supply of water is obtained. These fountains are fed by an aqueduct (completed in 1731), which crosses the valley of the Auzon by forty-eight arches, and is a massive structure. The principal buildings are—the cathedral, a Gothic edifice, with a spire of the age of Charlemagne; the Gate of Orange, surmounted by a high tower; the Hotel Dieu, which has a fine façade; the palace of justice or court-house, formerly an episcopal residence, and close by which is a Roman triumphal arch; the hospital, erected in 1751; the theatre, market, and the public library, containing 25,000 volumes, 2000 MSS., 6000 medals, and various antiquities, nearly all of which were bequeathed to the town, with the building, by Bishop Inguinbert. This library contains the Carpentras inscription, which is a few lines of Aramaic rhythmic verse on a stone, which is probably the oldest specimen of its kind existing of the Semitic languages. The inhabitants of Carpentras are employed in distilling brandy, spirits of wine, and various essences, in manufactories of nitric and sulphuric acid, glue, verdigris, and cotton and woollen yarn; or in dye-houses, tanneries, and silk or madder mills, the two latter being numerous and extensive. This town has also a considerable trade in liqueurs, olive-oil, fruit, almonds, madder, clover, lucerne seed, saffron, essences of various kinds, honey, wool, wax, and hides. The ancient name of Carpentras was Carpentoracete. The Romans embellished it with many edifices, but the successive ravages of the Goths, Vandals, Lombards, and Saracens have left few traces of them. The concordat of 1801 suppressed the bishopric, which had existed since the third century. In 1813 Pope Clement V. fixed his residence here, and made Carpentras the seat of the pontifical see. At his death the cardinals were so long appointing his successor, that the people, exasperated by their endless disputes and consultations, set fire to the college where they had assembled, and the flames spreading, a large portion of the town was consumed. The present walls were built fifty years after that event, by Pope Innocent VI.

CARPENTRY is the art of framing timber generally, and as a branch of the art of building embraces the framing of partitions, floors, and roofs. The neater wood-work of doors, window-frames, the planking of floors, skittings, and stairs, more properly belong to Joinery.

Carpentry requires a knowledge of the properties of timber, and of its strength when exposed to various strains. [See MATERIALS, STRENGTH OF.] This will teach the proper fitness of each kind of timber for its own peculiar purpose. It will show, for example, that while oak greatly exceeds fir in hardness and durability, it may be inferior to it under certain circumstances; because, while the fibres of a sawn beam of fir are so straight as to run in unbroken lines from end to end, those of a sawn beam of oak are often so tortuous as to be repeatedly divided by the saw. Seasoning, by long exposure to a current of air, is necessary to prepare timber for use in carpentry; but as the best seasoning will not entirely prevent subsequent warping, shrinking, and splitting or flying, timber should be so fitted together as to counteract as far as may be the effect of such changes. When it is required to bend timbers, they may be softened by boiling or steaming, and then brought to and secured at the desired curvature, which, when cold and dry, they will retain with very little variation.

Illustrations, more practically useful than any mere

outline or theory, of the principles of carpentry are given in such articles as HOUSE, ROOF, SCAFFOLDING, and TRUSSING; and the thoughtful reader will find no difficulty in tracing the application of the same principles in the framing of partitions and other kinds of carpentry. The method of joining timbers longitudinally, where single beams are too small for the purpose required, is treated of under SCAFFING.

CARPET. The following kinds of carpets are now made in Great Britain:—Axminster, Venetian, Kidderminster, British or damask Venetian, Brussels, Wilton or Pile-carpeting, and Tapestry. These names do not always denote either the present or original place of manufacture. Brussels carpets were introduced into Kidderminster from Tournay in 1745; and it is doubtful whether Venetians were ever made at Venice. Wiltons (which are in fact Brussels carpets) were made on the Continent before they were introduced at Wilton; and what are called Kidderminsters are made in the greatest quantities in Scotland or Yorkshire.

Axminster Carpets are usually made in one piece, according to the dimensions of the room for which they are required. The warp or chain is of strong linen, placed horizontally between two rolls or beams, which turn round and enable the chain to be rolled from off one beam and on to the other as the weaving of the carpet proceeds. Small tufts or bunches of different-coloured worsted or woollen are tied to or fastened under the warp; and when one row of the fur is brought to the surface with a comb the shoot of linen is thrown in, binding the warps together. Another row of tufts is then arranged in such a manner as, by a change of the colours, to form a further portion of the pattern. To guide the weaver as to the position of the colours, a small paper design or drawing constantly hangs before him, from which he works. The tufts wholly conceal the linen threads. Real Turkey carpets are manufactured in a similar manner, and they are regularly imported, though not in very large quantities. Finger or Townmade and Stormont rugs are also formed with tufts put in as they are in Axminster carpets, but with a different arrangement of apparatus.

Venetian Carpets.—Here the warp or chain, which is of worsted, and generally arranged in stripes of different colours, is alone visible; the shoot, which is of a dark colour and usually black, is concealed between the upper and under surface. By using shoots of different sizes these carpets are sometimes made to assume the appearance of plaids, checks, or twills.

Kidderminster or Scotch Carpets are formed by the intersection of two or more cloths of different colours; but as these cloths may be woven in stripes of different shades, by introducing at intervals shoots of different hues, the carpet is usually made to assume a great variety of colours. These carpets are sometimes "three-ply," or have three thicknesses of cloth; but for the most part they are "two-ply." Each cloth is perfect in itself, so that, if one cloth were carefully cut away, the other would remain perfect, and be in appearance like a very coarse baize. The process of weaving both cloths is carried on at the same time, and in each part of the carpet that cloth is brought to the surface which is required to produce that portion of the pattern. The back of the carpet will necessarily be of exactly the same pattern as the front, but the colours will be reversed. A complicated variety of the jacquard loom is employed in weaving these carpets.

British or damask Venetian Carpets partake both of the character of Venetian and Kidderminster, though more of the former than the latter. The warp, as in the Venetian, is the only part seen, whereas in Kidderminsters the shoot forms by far the greatest portion of what is visible.

Brussels Carpets form by far the most important and increasing portion of the carpet trade. Brussels are com-

posed of linen and worsted, the cloth or reticulated part of the structure being entirely of linen, which is formed into a kind of very coarse sampler cloth, with two threads of linen for the shoot (one above and the other below the worsted). The mode of bringing up to the surface the particular worsted thread which gives the pattern requires much ingenuity in the arrangement of the Brussels loom.

Wilton or Pile Carpets differ from Brussels only in this, that the loops of worsted are all cut through, and the carpet assumes a velvety appearance. At Glasgow a beautiful kind of velvet carpet is manufactured, in which coloured chenille is thrown in as a shoot, and afterwards cut at the surface. The manufacture of Brussels carpet was introduced into Wilton soon after its introduction into Kidderminster. The Wilton carpets, being originally a better description of goods, were distinguished by the name of Cut or Wilton Carpets.

Tapestry Carpet has of late years come into very extensive use as a cheap substitute for Brussels and Wilton, both of which it is made to resemble very closely in the brilliancy of its designs and variety of its patterns. Its manufacture is very ingenious. Instead of several coloured yarns being used, as in Brussels—only one of which is, however, drawn to the surface at any one place, the others remaining buried between the upper and under threads of the cloth basis—a single coloured yarn is used, and the variety of colour is produced by dyeing it of various colours at intervals of its length.

Felt Carpet, much used for bedrooms, is simply made by printing colours on felt.

Carpet Trade.—In addition to the immense quantity of carpets used in the United Kingdom, from 9,000,000 to 12,000,100 yards are annually exported, the exact number in 1884 having been 11,538,800 yards, value £1,257,637. The countries which took the largest quantities were the United States, France, British America, and Australia. In the same year 850,000 rugs, coverlets, or wrappers, were exported, valued at £260,000. About 120,000 yards of carpet, value £40,000, are annually imported into the United Kingdom—two-thirds from Turkey, and the remainder from Germany and France.

CARPOLOGY is a division of botany comprehending what relates to the structure of seeds and their seed-vessels, or what is commonly called fruit.

CARPUS, the bones of the wrist. See HAND.

• **CARRACCI, LODOVICO, AGOSTINO, and ANNIBALE**, three of the first painters of Italy, kinsmen, fellow-students, and fellow-labourers, were natives of Bologna, and founders of the Bolognese or Eclectic School. Lodovico was born in 1555, and was placed at an early age with Prospero Fontana to study painting. After leaving Fontana he travelled to Parma and Venice, where he became acquainted with Tintoretto. Returning to Bologna, he found his cousins, Agostino and Annibale, so well inclined to his profession that he persuaded their father to leave their education to him. Agostino, who was born in 1557, was very versatile in his pursuits; among other things, he had learned engraving from Cornelius Cort, and attained to great excellence. He never practised painting, however, with any constancy, but indulged his ingenuity in various pursuits connected with literature and the liberal arts, working at his easel by fits and starts.

Annibale, born in 1560, exhibited a perfect contrast to the phlegmatic calmness of Lodovico and to the accomplished fickleness of Agostino. He laboured in his vocation with an unwearied and enthusiastic devotion, and a singleness of purpose which has never been excelled, perhaps not equalled. He disliked all study but that of painting, and more than once burst out into complaints against the school-like refinements and the slow proceedings of his kinsmen in their pursuit of excellence. The National Gallery contains no less than eight fine pictures of Annibale Carracci,

as well as some by Lodovico and Agostino. The three opened an academy at Lodovico's studio, which became famous for the illustrious pupils whom it sent forth—for instance, Domenichino and Guido.

The works of the three kinsmen are principally in Bologna and Rome. The decoration of the Farnese Palace is considered the greatest work of Annibale. The Louvre contains the "St. John the Baptist" by Lodovico, and the "Communion of St. Jerome" by Agostino, which are respectively reckoned their best works in oil.

Annibale died in 1609; he was buried, according to his own desire, by the side of Raphael. Agostino died in 1602; Lodovico lived until 1619. The younger members of the family are not illustrious.

CAR RAGEEN MOSS is a sea-weed (*Chondrus crispus*) belonging to the tribe Florideæ. [See ALGÆ.] It is found on the west coast of Europe from Norway to Gibraltar, and on the east coast of North America. It is chiefly imported from Sligo. It has a flat dilated frond, broadly fan-shaped, on a slender stalk, which is expanded at the base into a disc for attachment to rocks. The plant is from 3 to 10 inches high. It possesses emollient, demulcent, and, to some extent, nutritive properties, and is used in the form of a decoction or jelly. In America it is also used for fining beer, coffee, &c.

CARRARA, a town of Italy in the province of Massa-Carrara, on the small river Avenza, 2 miles from its mouth in the S.E. part of the Bay of Genoa. The chief buildings of Carrara are—the collegiate church of Sant'Andrea, dating from the thirteenth and fifteenth centuries, the Madonna delle Grazie, and the ex-ducal palace. It has also an academy of fine arts, and its streets are ornamented with many beautiful fountains. The town derives its chief importance from the marble quarries which are in its neighbourhood. These have been wrought from the age of Augustus, and probably from a still more remote epoch. They are found in the lower ridges of the hills which unite in the Monte Sagio. The beds of the dove-coloured (*bardiglio*) marble are the nearest to the town. Higher up the valley are the beds of white marble. Only a few of these beds produce marble of such a grain and transparency as to be highly prized by the statuary; and if the quarrymen succeed in obtaining one block in ten that preserves throughout a good colour, they are satisfied. Still higher up, the marble becomes of a dull, dead colour; but of this much larger blocks may be obtained. The principal quarries of veined marble are in a parallel valley. Notwithstanding the vast quantities that have been dug up since these quarries began to be wrought, the supply of marble in this district seems to be now as inexhaustible as ever. About 6000 men are always employed in the quarries. It is an Oolitic limestone greatly altered by plutonic action.

CARRICKFERGUS, a maritime county of a town and in the north of Ireland, is situated on the north shore of Belfast Lough, and inclosed on all other sides by the county of Antrim. It is 9 miles on the N.N.E. of Belfast by railway, and 112½ miles N. from Dublin. It incloses an area of 26 square miles, or 16,700 acres. The surface is hilly. The population of the county in 1881 was 10,009. Carrickfergus was formerly a place of great strength, and was frequently besieged. Some traces of its fortifications remain, and its castle, built on a rock which projects into the sea, is kept up as an arsenal, and is mounted with heavy guns. From the top of the keep a splendid view is obtained. The castle was chiefly erected about 1128. The public buildings are—the town-hall, Episcopal church, Roman Catholic chapel, meeting-houses for dissenters, and market-house. The town has some trade and manufactures of linen, and the fisheries are extensive. The oysters taken off the coast are prized for their flavour and size. Much of its former importance

arose from its being the county town, but the assizes and other county business have been removed to Belfast. In the neighbourhood there are many mills connected with the trade of that town. About $1\frac{1}{2}$ mile north-west of the town rock-salt, remarkably pure and of great thickness, has been discovered, and large quantities of excellent salt are annually manufactured. The landing-pier has been improved, and vessels of 100 tons can now discharge at it. King William landed here on the 14th June, 1690, sixteen days previously to the battle of the Boyne. Carrickfergus formerly returned a member to the House of Commons, but was deprived of direct representation by the Redistribution Bill.

The first name of the place was Knockfergus. It was a stronghold of King Fergus, who is recorded to have afterwards passed over and settled in the county of Argyll, taking with him the celebrated hith-fail or stone of destiny, on which the Scottish kings were crowned at Scone, near Perth, carried off thence by Edward I., and now in the royal chair in Westminster Abbey. In 1315 the castle was besieged by Edward Bruce, who took it after a desperate resistance. In 1642 the first Presbytery held in Ireland met in Carrickfergus, the town having become a refuge for many Scotch Covenanters and Antium Protestants. In 1760 it surrendered to a French naval force under Turot, who soon after evacuated it on the appearance of the English squadron under Commodore Elliot, by whom Turot's squadron was captured after an engagement in which he lost his life. On the 24th April, 1778, Paul Jones captured the *Drake* sloop of war in the bay; but sailed off without making any hostile attempt on the town.

CARRICK-ON-SHANNON, a market town of Ireland, the capital of the county of Leitrim, Connaught, situated on the Shannon 19 miles N.N.W. of Longford. It has a Protestant and a Catholic church, and an infirmary. A trade in butter, grain, and provisions is carried on by the river Shannon, now rendered navigable to Lough Allen, as well as by railway. Yarn is also manufactured. The Shannon is here crossed by a bridge of eleven arches. Population, 6583.

CARRICK-ON-SUIR, a market-town of Ireland, in the county of Tipperary, 6 miles E. from Clonmel, and 118 miles from Dublin by the Waterford and Limerick Railway, is situated on the north bank of the Suir, which is navigable to this point for vessels of 200 tons burden. The town consists principally of one long street, from which three smaller ones diverge northwards. It contains a court-house, bridewell, fever hospital, dispensary, work-house, small cavalry barracks, a church, nunnery, and two Roman Catholic chapels. On the opposite bank of the river, in the county of Waterford, are the suburb of Carrickbeg, where there are the remains of a fine abbey, and Carrick-on-Suir Castle, built in 1369. This place formerly possessed very extensive woollen manufactures, but for some years they fell into decay. They have, however, been revived, and some linen and flax mills also established, which give quite an industrial and prosperous appearance to the town. Many workmen's cottages and new shops have also been built. From its central position, and adjoining, as it does, three counties, the town has a large general trade, and the shipments of corn, butter, bacon, and other agricultural produce are considerable. Population, 5417. The vicinity is fertile and well wooded, and about 4 miles to the south is Carraghmore, the seat of the Marquis of Waterford.

CARRIER, one who for hire undertakes the conveyance of goods or persons for any one who employs him. In a legal sense it extends not only to those who convey goods by land, but also to the owners and masters of ships, mail contractors, and even to wharfingers who undertake to convey goods for hire from their wharfs to the vessel in their own lighters, but not to mere hackney coachmen. By ancient custom (which, being acknowledged by judicial

decision, becomes law), a common carrier of goods for hire is not only bound to take goods tendered to him, if he has room in his conveyance, and he is informed of their quality and value, but he is liable for their loss, except in three cases:—1, Loss arising from the king's public enemies; 2, loss arising from the act of God, such as storm, lightning, or tempest; 3, loss arising from the owner's own fault, as by imperfect packing.

In order to settle disputes as to loss and injury between carriers and persons whose property they carried, 11 Geo. IV. and 1 Will. IV. c. 68 was passed, by which it is enacted that no common carrier by land shall be liable for the loss of or injury to certain articles, particularly enumerated in the Act, contained in any package which shall have been delivered, either to be carried for hire or to accompany a passenger, when the value of such article shall exceed £10, unless at the time of the delivery of the package to the carrier the value and nature of such article shall have been explicitly declared.

Steamboat and railway companies often print on the back of their receipts or tickets certain conditions under which they do not consider themselves liable for damage, loss, &c. In a case decided in 1875, however, by the House of Lords, on appeal from the Court of Session in Scotland, it was held that the liability of a company to make good loss is not extinguished by special contracts between the parties; and further, that no contract could be established by merely printing its terms on the back of a ticket, no proof being offered that its receiver's attention had been called to it, or that he had in any way signified his assent to it. And even when agreed to, the contract is still void if not considered just and reasonable.

A carrier can refuse to deliver up goods which have come into his possession as a carrier until his reasonable charges for the carriage are paid.

CARRIER, JEAN BAPTISTE, one of the most savage and ferocious of the French revolutionists, was born at the village of Zola, near Aurillac, in 1576. He practised the profession of an attorney, and in 1792 was sent as a deputy to the National Convention. He voted for the execution of the king, was one of the first to demand the arrest of the Duke of Orleans, and took a leading part in the overthrow of the Girondists. His lust for cruelty marked him out as being a fitting person in the eyes of the revolutionary leaders to be sent to suppress the revolt of the Vendéens, and the result of his appointment more than justified their expectations. Finding the prisons full of those who had been arrested for taking part in the risings, he gathered round him a band of furious savages, and proceeded to destroy the prisoners without trial, and with the most inhuman barbarity. Vessels were filled with men, women, and children, and then scuttled and sunk in the Loire; and men and women, tied together, were flung into the river until the water became so poisoned that its use for drinking purposes was prohibited. The former brutalities are known as the *noyades*; the latter were called by their fiendish perpetrators *mariages républicains*. Twenty-five *noyades* are registered against Carrier. His jocular despatch announcing the first *noyade*, of ninety priests, makes the blood run cold: "These men being sentenced to transportation, I have executed the sentence—*vertically!*" Large numbers also were shot, guillotined, or butchered in the prisons, as many as 500 being sacrificed in a single massacre. In his reports to the Committee of Public Safety he concealed the full extent of his crimes, but on their becoming known he was recalled and put upon his trial. He pleaded that in all he had done he had only obeyed the orders he had received, but was ultimately condemned to death, and guillotined on the 16th December, 1794.

CARRIER SHELLS is the name given to the molluscous animals comprising the genus *Phorus*, which belongs

to the same family of the *GASTROPODA* as the common *PERIWINKLE*. The carrier shells are very numerous in the China and Java seas, living in from 15 to 30 fathoms water, and generally preferring a bottom composed of the detritus of dead shells and sand mixed with mud. Many species attach foreign substances, such as stones, shells, or corals, to the margin of their shells. They are called in consequence "mineralogists" and "conchologists" by collectors. The mode of progression adopted by the carrier shells is peculiar. They scramble over the ground, lifting and throwing forward the shell like a tortoise, with the tentacles stretched out, the proboscis bent down, and the operculum trailing behind.

In the carrier shells the shell is concave beneath and irregular; the whorls are flat, the spire depressed, the aperture wide, and the operculum horny. There are nine living species, all inhabitants of the tropics. Fifteen fossil species have been described from the Eocene formations of Britain and France.

CARRION BEETLES is the name given to the Silphidae, or a family of BEETLES belonging to the group CLAVICORNIA and the section PENTAMERA. In this family the body is depressed; the thorax is more or less circular, its sides being expanded, while the head can be drawn down under it. The antennae are thickened at the tips. The larvae of these insects have a great general resemblance to those of the STAPHYLINIDÆ. They have four jointed antennae, and two styliform appendages on the last segment of the abdomen, and an anal prolongation which assists them in progression. Although the chief food of this group consists of decaying animal matter, yet some of them live on fungi and other vegetable remains. One species, *Silpha quadripunctata*, lives exclusively upon trees, feeding greedily on caterpillars.

Many species of this family are found in England, one of the best known being the common BURYING BEETLE (*Necrophorus vespillo*). Another common English beetle is *Necrodes littoralis* (Plates BEETLES, fig. 23); it is closely allied to the genus *Necrophorus*, but does not possess the burying instinct, choosing the carcases of large animals in which to feed and reproduce its kind. Many species of the genus *Silpha* prey on snails, living and dead. In this family is placed the curious genus *Leptodirus*, characterized by its oval elytra, closely united at the suture, and by the very long, slender, cylindrical thorax, from which its name is derived. There are three species known, which live exclusively in the innermost recesses of caves in Carriola. They are quite blind, and are of an uniform brown or ferruginous hue.

CARRION CROW. See CROW.

CARRONADES were short iron guns, differing from other guns in being lighter, in having a chamber for powder (like mortars), and in the manner of attaching them to their carriages, which is by a joint and bolt instead of trunnions. They derived their name from the village of Carron, in Stirlingshire, where they were first made. For many years from 1779, the date of their introduction, they were greatly used in the English and French navies; but as they were valuable only at short ranges, they are now obsolete.

CARRONSHORE, a village of Scotland, in the county of Stirling, 2 miles N. by W. from Falkirk, is near the Carron Ironworks, which were established in 1760 on the property of the Bruces of Kinnaird, by the exertions of Dr. John Roebuck, a fellow-labourer with James Watt in improving the steam-engine, and were at one time probably the largest in Europe. They are now, however—although still extensive, and employing 2500 men—surpassed by some similar establishments in Scotland, and by several in England. The goods manufactured are chiefly stoves, ranges, grates, and articles for household use. Formerly large quantities of warlike matériel, such as cannon, carronades (which took their name from the place), mortars,

shot, and shell, were made; but this part of the trade has now become extinct. The Forth and Clyde Canal runs within a quarter of a mile of the works, so that access to both friths is most convenient. There is abundance of coal in the neighbourhood, but the iron-stone and limestone are chiefly brought from a distance, large quantities of the former being obtained from Kilsyth. The population of the village of Carronshore is only 962. The river Carron was at one time the boundary of the Roman empire on the north-west. It rises near Fintry, on the Campsie Fells, close to the sources of the Kelvin and the Endrick, and after a course of 17 miles falls into the Frith of Forth at Grangemouth. There are some ruins of the ancient *Canclon*, and the site of the monument known as Arthur's Oven or Oon is in the vicinity of the works.

CARROT. As food for cattle carrots are of great importance. The orange carrot and its varieties are the most common in England, but the large white and yellow carrots are more esteemed on the Continent; they are supposed to contain more saccharine matter, and to produce a greater bulk of nutriment on the same extent of ground. The white carrot will also grow on heavier soils than the orange, and may be sown in spring among barley, in the same manner as clover usually is, with this difference, that the roots are taken up before winter, and the land may be sown with winter corn the same year.

When carrots are cultivated in a regular rotation as a principal crop they are sown in March, on land which has been ploughed to a considerable depth before winter, and has had the benefit of the winter's frost. It is not usual to manure the land, but it is best to sow carrots on land which has been abundantly manured for the preceding crop. The best mode of cultivation is to have the land in a moderately rich state, and thoroughly pulverized; to sow the seed in drills, at the distance of a foot or more from row to row; to cover it slightly, and as the plants appear, to water them with diluted urine or the drainings of dunghills; to destroy all weeds carefully by the hand and the hoe; and to thin the plants in the rows to the distance of 5 or 6 inches or more, according to the richness and depth of the soil. Two pounds of seed are sufficient for an acre if the seed is drilled; it requires double the quantity if sown broadcast.

The best method of taking up the carrots, to store them for winter use, is by means of three-pronged forks, such as are used in digging asparagus beds. The plough is sometimes used after the coulter has been removed; but, with all the care of the ploughman, the plough and the horses will cut and bruise many of the finest carrots. Carrots may be kept all winter in dry cellars, if they are protected against the frost. The more common way is to store them in straw in long trenches. The produce of carrots on good light land is nearly double that of potatoes, and they do not impoverish the land so much. From 20 to 40 lbs. of carrots, with a small quantity of oats, is a sufficient allowance for a hard-working horse for twenty-four hours. Where hay is scarce, it is a most economical substitute; and where the value of urine is known carrots are much prized, as they greatly tend to its increase.

If carrots are cut in pieces and steamed, they become more nutritious, and the expressed juice made to ferment affords by distillation a very good and wholesome spirit. Sugar may also be extracted. As a vegetable for the table, carrots are esteemed. They are generally preferred to parsnips. Professor A. H. Church gives the composition as follows:—In 100 parts there are of water 89; of albumen, 0.5; sugar, 4.5; gum and pectose, 0.5; fat, 0.2; cellulose and lignose, 4.3; mineral matter, 1.0.

CARRUCA, among the Romans a four-wheeled carriage, which was covered and adorned with carved ivory or the precious metals. Its form was square; it had a pole, and was drawn by mules; hence comes our word *carriage*.

CARSE, a Scotch term applied to an alluvial river, plain, or the bed of a dried-up lake. The soils of a carse are usually of a rich and fertile nature, composed of argillaceous deposits, but in some these are only unproductive clays. The Carse of Stirling, from Bucklyvie to the eastern extremity of the county, has a rich area of 80,000 acres; that of Gowrie, in Perthshire, is a fertile tract of land extending from the Tay to the Sidlaw Hills for a distance of 15 miles.

CARSTAIRS, a village in the county, and 5 miles N.E. of the town, of Lanark, 25 miles S.E. of Glasgow, 27 S.W. of Edinburgh, and the point of junction of the railway lines from those cities with the central line to England. It is supposed to be the ancient *Corin-Carr*, a Roman post, and the capital of the Damnii. Roman remains have been found in the neighbourhood.

CART (from Welsh *cart*, diminutive of the Celtic *car*, Welsh, Erse, and Old Gaelic, "a chariot;" the Latin *carrus* being derived from the Gaulish form of the Celtic word, which in its turn comes from the prehistoric ARYAN ROOT $\sqrt{\text{KAR}}$, "to roll"), the general name for all carriages with two wheels used for carrying heavy loads. Carts are chiefly used by agriculturists and carriers, and they differ much in size and shape, according to the uses for which they are intended and the country in which they are made. The drag-cart without wheels, which is used in some mountainous districts, is one of the simplest contrivances for transporting heavy weights. It consists of two strong poles, connected by cross pieces fixed at right angles to them, the ends resting on the ground. The other ends of the poles form the shafts for the horse to draw by. The Irish car may be considered as the next step towards a better construction. This car consists of a bed or platform and two shafts. The wheels, in the simplest form, are round discs of wood, fixed on a square axle of wood at the distance of 3 or 4 feet from each other. To the under part of the bed of the cart two blocks of wood are fixed, which raise it so that the wheels may go under the cart, and in these blocks are two round holes to admit the ends of the axle. This is the simple old Irish car. The only difference in the construction of the most improved modern carts is the substitution of neat wheels and iron axles for those described above, and a railing or box fixed on the platform.

The body of the common cart rests on a fixed axle between the wheels, which turn upon the axle by means of boxes in the centre of the naves. The simplest cart is that used by carriers in France and Germany. It consists of two strong poles of ash or beech, the ends of which form the shafts passed on the axle. The wheels are often nearly 6 feet in diameter, and narrow at the tire; they are slightly dished, but run nearly perpendicularly to the road. These carts sometimes take such great weights as to require five or six horses to draw them. Where the roads are level and the waggons are much to be preferred to carts; but in many countries and on bad roads carts have many advantages. For agricultural purposes various kinds of carts exist in this country. The capacious tumbrel for carting earth and dung, with broad wheels to prevent their sinking in soft ground, is too generally known to require description. The light Scotch cart, drawn by one horse, is justly considered the most suitable for transporting earth, lime, or dung, especially in hilly countries. It is low and short, so that the horse draws very near the centre of gravity, and little power is lost by obliquity. By the addition of a light projecting framework it can be made to conveniently carry hay, straw, and other bulky loads. Carts of this kind are also arranged to tilt up, so that their contents can be discharged without unyoking the horse. To avoid having the weight resting on the back of the horse, vehicles with three wheels, the additional wheel being made to turn in front, are sometimes used. The addition of springs to carts and

waggons is a very great improvement, the additional weight and cost being counterbalanced by the fact that they lessen the draught, and by preventing jolting add to the durability of the vehicles.

CARTAGENA or **CARTHAGENA** (*Carthago Nova* of the Romans), a seaport on the Mediterranean, in the province of Murcia, in Spain. Cartagena was a colony from Carthage, in Africa, founded by Hasdrubal Barca in 243 B.C. It afterwards became the chief town of the *Contestani*. Its mines of argentiferous lead were a source of great wealth to the old Carthaginians, and later to the Romans. They were reopened in 1489, and are now again worked. It was taken by Scipio in 208 B.C., and the Romans made it a colony under the name of *Colonia Victrix Julia Nova Carthago*. It was destroyed, A.D. 421, by the Vandals, and rebuilt by Philip II., on account of its fine harbour. Up to 1219 Cartagena was the seat of a bishopric, but this was then removed to Murcia. During the various wars which have at different times convulsed the peninsula, it has generally suffered at the hands of the contending parties. Cartagena is one of the three naval stations of Spain; it has a royal dockyard, a fine basin, a gun wharf, a castle, and a baguio for the galley slaves. In the government dockyard is an immense floating dock, constructed by Messrs. Rennie, of London, which has answered admirably. The harbour is one of the best in all Spain, and has been much improved by works recently completed. They include two breakwaters—one from the east shore and one at the western entrance—which effectually protect it from south-westerly gales. There are 80 feet of water close under the walls of the town. It is defended by batteries at the entrance, and by several forts and redoubts on the surrounding hills. La Escombrera, the ancient *Scombraria*, about $2\frac{1}{2}$ miles from the entrance, shelters the port from the violence of the wind. It communicates with the Segura River by the Lorca Canal. The town is walled, and though many of the streets are fairly wide, yet as the houses have an ancient appearance, from the stone of which they are built being of a friable nature, and its cathedral and the ruins of an old castle on the top of a hill are of the Moorish style of architecture, it has quite a Moorish aspect. Its principal buildings are several churches and convents, a marine school, a royal and founding hospital, town-hall, observatory, theatre, and circus, and the buildings connected with the trade and fortifications of the place. Population, 75,908. It has some manufactories of cloth for sails, of cables and ropes, and other articles for shipping. The country around produces corn, wine, oil, barilla, and esparto grass. From the latter, which is the Spanish broom, or *Spartum*, the Romans often called the town *Carthago Spartaria*. The transportation of the ores worked in the neighbouring mines, and the extraction of the metals, employ a great number of the inhabitants. Gypsum, saltpetre, rubies, and amethysts are also found in the country around. Coke and coal, chiefly English, are the main imports.

In the very disturbed state of Spain in 1873, when the "Intransigentes" were exciting local insurrections in the south against the central government, so as to carry out their idea of communal or cantonal independence, the town of Cartagena was seized by them, as well as the national squadron at anchor in the port, consisting of four frigates and three steamers. A land and naval force was immediately despatched to recapture the city and ships, but the revolutionary Junta, established as the "Provisional Government of the Spanish Confederation," defended the place so vigorously that it was not taken until 1874, after having undergone a siege of several months' duration.

CARTAGENA or **CARTHAGENA**, a seaport in the Republic of Colombia, on a sandy peninsula in the Caribbean Sea, a little S.W. of the mouth of the Rio Magdalena. Population, 25,000. The harbour of Cartagena

is one of the safest and most convenient in all America; it lies to the south of the town, between the peninsula on which it is built and the island of Tierra-Bomba and the mainland. It had originally two entrances—the Boca Grande, close to the city, and the Boca Chica (narrow passage), several miles further south. The former, however, was blocked up by the Spaniards subsequently to Admiral Vernon's attempt upon the place in 1741, by sinking several ships in the channel. The Boca Chica is defended by two strong castles; it is so narrow that only one vessel can enter at once. The harbour itself is about 6 miles long, and from 2 to 4 miles broad; it is deep, has good anchorage, and its surface is as smooth as that of a river. To the east of the town is another low island, on which the suburb of Xiximani stands; they are connected by a wooden bridge. Another bridge unites the suburb with the mainland. The town is regularly built, with straight but rather narrow streets, and houses constructed with balconies in the Spanish style. It is well fortified; but it is commanded by a hill called Popa, which is not fortified, and on which a convent stands. Among the public buildings are immense cisterns for preserving rain-water, as the spring water is bad. The climate, though hot, is healthy, and the soil around the city wonderfully fertile. The principal imports are cotton and woollen goods, glass, cutlery, and hardware; the exports, sugar, tobacco, coffee, cotton (chiefly obtained from the wild plant), divi-divi, ivory, and cocoa-nuts, hides, balsam of Tolu, and caoutchouc.

Cartagena was founded in 1533, and was long considered as the great bulwark of the Spanish possessions in South America. It was taken by a Corsican pirate in 1544, by Sir F. Drake in 1583, and by the French in 1697. Under the Spaniards it was a bishopric and the seat of a captain-general, and one of the three tribunals of the Inquisition in America. It is still the residence of a bishop.

CARTE-BLANCHE (literally, white card) is a paper signed and, if necessary, sealed by the party against whom it is to be used, but (with the exception of the signature and seal) blank, in order that it may be filled up with such condition as the party to whom it is delivered may prescribe. The term is often used to express an unrestricted authority delegated by one man to another; thus, a general is said to have *carte-blanche* from his sovereign when he has leave to carry on the warfare at his own discretion.

CARTESIAN PHILOSOPHY. See DESCARTES.

CARTHAGE, called by the Greeks *Carthēdon*, an ancient city and state, long the rival of Rome, was a colony of the Tyrians, and was built, according to tradition, about 860 B.C. The word *Karthada*, its true Punic name, means "new city."

The city of Carthago ruled over all the rest of the country. The constitution was an aristocracy. The chief authority was vested in the senate. It was not an exclusive aristocracy, nor essentially hereditary, but was recruited out of the class of the more wealthy citizens, or those who had rendered services to the state. The senators appear to have been for life. The senate contained within itself a select body or council of state, which the Greek writers call *Gerusia*. The Carthaginian *Gerusia* is said, by some writers, to have consisted of 100 members. This "Council of the Hundred" is also mentioned by Aristotle, whose "Politics" is our chief source of information, as forming the highest magistracy, and deciding all causes.

Two *suffetes*, whom the Greek and Roman writers call kings, appear to have been at the head of the executive; they presided in the senate. Aristotle says that the main difference between them and the two kings of Sparta was that the office of the former depended upon election, while that of the kings of Sparta was hereditary in two families. A *suffete* was at times general also, and as such headed the armies of the republic, while his colleague remained at home. When the senate and the *suffetes* could not agree

upon some particular points, the question was referred to the people or citizens at large for their decision. The magistrates were either elected by the people, or proposed by the senate and approved by the people; and Aristotle observes that bribery was resorted to, and that offices were bought and sold at Carthage. We may gather from Polybius, Appian, and others, that conjugal and parental feelings were strong among the Carthaginians. Their religion or mode of worship, which was originally gloomy and cruel, they derived from Phœnicia. Melcarth, "king of the city," was their tutelary deity, and was perhaps the same as Moloch, to whom they immolated the children of the noblest families to propitiate his wrath (see the powerful novel "*Salammbô*," by G. Flaubert, for a vivid account of this custom, and of ancient Carthage in general). Asharoath or Astarte, the goddess of the moon, was another of their deities. We hear of no sacerdotal caste possessing exclusive influence at Carthage.

The country in the neighbourhood of Carthage, and indeed all that tract which formed its real territory, and which corresponds to the present state of Tunis, was well cultivated. Mago, a suffete of Carthage, who flourished about 550 B.C., wrote a work on agriculture in twenty-eight books, which the Romans carefully preserved, taking it out of the libraries of Carthage when they destroyed that city. It was translated by D. Silanus, but is unfortunately lost. Roman authors, as Pliny, &c., borrow considerably from this work, which they quote with great praise. The Carthaginians derived their public revenue from the taxes paid by the provinces.

The Carthaginians at an early period took possession of the smaller islands near their own coasts, such as Malta, Lampedusa, the Balearic, and Lipari Islands. The Balearics produced wine, oil, and fine wool, and Malta was celebrated for its cloth manufactures.

The intercourse of the Carthaginians with their mother-country, Tyre, seems to have been closely maintained. Their policy and their old enmity towards the Greeks led them to enter into correspondence with the Persian kings, especially at the time when Darius and Xerxes invaded Greece. They also joined the Etruscans at an early period against the Phœceans, who had settled in Corsica, and afterwards the Ligurians against the Phœcean colony of Massilia (Marseilles), by whom, however, they were defeated at sea, and precluded from forming establishments on the coast of Gaul.

The real territory of Carthage seems to have extended southwards as far as the Lake Tritonis, and westward not much beyond the frontiers of the present state of Tunis, for Cirta, the modern Constantina, was the capital of an independent Numidian kingdom. But even in the tract of territory which may be considered as belonging to Carthage, there were along the coast several old Phœnician colonies, such as Utica, Leptis, Hippo, Hadrumetum, which appear to have stood in the relation of allies to Carthage, retaining their municipal independence. But the political influence and indirect sway of Carthage extended much further inland over many tributary native chiefs; and it had settlements all along the north African coast, eastwards as far as the boundary of Cyrene, and westwards as far as the Pillars of Hercules, on the Straits of Gibraltar.

Sardinia was probably the first foreign conquest of Carthage. Hasdrubal, the son of Mago, fell in battle in Sardinia; but his brother Hamilcar reduced part of the island, where the Carthaginians built the colonies of Calaris (Cagliari) and Sulci. About 480 B.C. Hamilcar was sent to Sicily with a great force, but he was totally defeated by Gelon, the tyrant of Syracuse. There was after this a period of seventy years of peace, during which Carthage seems to have reached the highest point of its commercial prosperity. It was during this time that it sent two fleets to explore the western coasts of Africa and

Europe. The first was commanded by Hanno, a suffete, son of Himilcar. [See HANNO.] The other expedition, under Himilco, was sent round the coast of Lusitania (Portugal) and northwards as far as Cape Finisterre. [See AVIENSUS.] The Carthaginians discovered not only the Fortunate or Canary Islands, but Madeira also.

The second Carthaginian expedition into Sicily took place about 410 B.C. Eventually Carthage secured firmly the west extremity of the island, the river Haliclus, between Selinus and Lilybæum, forming its eastern boundary. War broke out again between Carthage and Syracuse about 310 B.C., when Agathocles was tyrant of the latter city. The Carthaginians assembled an army in Sicily, and totally defeated Agathocles, 309 B.C., who upon this carried the war into Africa. This was the first deadly thrust at the power of Carthage, whose weak point being thus discovered, the example was afterwards followed by the Romans. See AGATHOCLES.

The great events in the history of Carthage are the wars with Rome, commonly called the Punic Wars. The first began B.C. 265, and the last terminated in the destruction of Carthage, B.C. 146. By a decree of the Roman senate, the city was razed to the ground. The destruction of this great commercial city was one of the most brutal acts of Roman policy. To Africa the destruction of Carthage was a retrograde step in civilization, for there was never afterwards a native power in that part of the world that could be compared to Carthage. The Carthaginian colonies beyond the Pillars of Hercules were forgotten, and the key to their discoveries and extensive trade was lost. The literature of Carthage likewise perished; the Romans gave its libraries to their Numidian allies, and we know through Sallust that King Hiempsal had a collection of Carthaginian historians, from which Sallust derived some information on the early history of Africa.

C. Gracchus attempted to establish a colony on the site of Carthage, B.C. 122, but the settlement made little progress until Julius Cæsar, and Augustus after him, sent colonies to build a new town, which was called Colonia Carthago, and occupied a small part of the ground of the old city. It rose to considerable splendour, and became the first city of Roman Africa, and the third city of the empire. In A.D. 439 it was taken by the Vandals under Genseric; it was retaken by Belisarius in 533; and, lastly, was destroyed by the Saracens in 647. Thus ended the second Carthage. The existing ruins belong to Roman Carthage. The outline of the earlier city is no longer traceable, in consequence of its having so frequently been destroyed, and the site itself has also undergone extensive changes, though the action of the river Bagradas, the silting up caused by the sand drifting before the prevalent N.E. winds, &c. Mommsen, in his "History of Rome," gives the following account of this interesting locality:—

"Carthage was rendered a place of great strength, partly by the nature of its situation, and partly by the skilful construction of its walls, to which the inhabitants were frequently compelled to trust for protection. In the spacious bay of Tunis, bounded on the W. by Cape Farina, and on the E. by Cape Bon, a promontory projects in the direction from W. to E., three sides of which are washed by the sea, the remaining side, towards the W., alone being connected with the mainland. This promontory, the narrowest part of which is not above 2½ miles in breadth, and altogether somewhat flat, expands as it abuts on the bay, and terminates in the two heights of Jebel-Khavi and Sidi-Bu-Said. Between these extends the plain of El Mersa, on the south portion of which, bounded by the height of Sidi-Bu-Said, lay the city of Carthage. The somewhat precipitous hill of about 400 feet of this height towards the sea, with its numerous cliffs and chasms, afforded a natural protection to the city on the side towards the bay, where a simple rampart

sufficed; while the land side on the west, being unprotected by natural means, was provided with a wall constructed with the utmost care and ingenuity.

The castle-hill, or Byrsa (Syriac *birtha* = castle), was a comparatively lofty rock, 188 feet in height and 1½ mile in circumference, abutting on the south extremity of the wall in the same way as the cliff of the Roman Capitol advances so as to touch the ramparts of the city. The upper plateau of the eminence was occupied by a vast temple of the patron deity, founded on a basement approached by sixty steps. The S.W. side of the city was bounded by the shallow lake of Tunis, which was almost entirely separated from the bay by a low and narrow tongue of land projecting from the Carthaginian peninsula; on the south-east side lay the open bay. On the latter side was situated the double harbour of the city, constructed by artificial means. The two harbours were separated by the city wall, which, extending east from the Byrsa, excluded the neck of land and the outer or commercial, but included the inner or naval harbour, so that the entrance to the latter must have been closed by a gate. To the north of and outside the town lay the considerable space of the present El Mersa, at that period called Magalia, principally occupied by country residences and carefully cultivated gardens, and inclosed by a rampart of its own adjoining the city wall. On the opposite extremity of the peninsula, the Jebel-Khavi, near the modern village of Kamart, was situated the city of tombs. This region of Kamart, with its shifting sand-hills, now affords some idea of the appearance of the desert. Thus the city, the suburb, and the tombs occupied the entire width of the promontory on the side towards the bay, and were accessible only by the two highroads to Utica and Tunis, which traversed the narrow neck of land already described. The latter, although not protected by a wall, afforded the most advantageous position to armies posted there for the protection of the city."

For the commerce and colonies of Carthage, the reader may refer to Heeren's "Researches;" and for its political history, to Botticher's "Geschichte der Karthager" and Mommsen's "History of Rome," &c.

CARTHUSIANS, a monastic order founded in 1086 by St. Bruno, who, with six companions, retired from society, and adopted the life of hermits at a solitary place about 10 or 12 miles from the town called Chartreuse, whence the name of the order. Their rule was composed about forty-five years later, under the fifth prior Guido, and the order obtained papal sanction in 1170. The austerities practised by the monks were of a very severe description. They were forbidden to eat meat at any time, and only to eat fish when it was presented out of charity. Three days a week they were required to fast upon bread, salt, and water, and there were in addition several prolonged fasts in each year. To each monk was allotted a separate cell, where he was to sleep, work, and take his solitary meals; unbroken silence was enjoined, except on certain specified occasions, and each monk was required to wear a hair shirt at all times. They practised agriculture, were given to hospitality and works of charity, and the order has rendered valuable service to literature. The Carthusians now form but a very limited order, but at one period they had no fewer than 172 monasteries, of which nine were in England. An order of Carthusian nuns was also established at Salcele, on the Rhine, somewhere about 1229.

CARTIER, JACQUES, a French navigator and explorer, was born at St. Malo in December, 1494. He discovered Canada in 1534, and in two subsequent expeditions explored the river St. Lawrence up to where Montreal now stands. The river was so named because Cartier discovered it on St. Lawrence's Day. Francis I. created him seigneur of Limoillon, a village near his native town.

CARTILAGE, commonly called gristle, a substance intermediate in density between the membranous and bony structure of the body. It is distinguished by its pearly whiteness, its smoothness, its firmness, and its extreme elasticity. One kind of fibrous cartilage is yellow instead of white.

The simplest form of cartilage consists merely of nucleated cells, and closely resembles the cellular tissue of plants. This kind is found in the rudimentary spinal column of the early embryo; it also exists in the chorda dorsalis of the cartilaginous fishes. In other kinds of cartilage (hyaline, fibrous, &c.) the cells are embedded in an intercellular substance or matrix presenting certain varieties of appearance. It is the matrix which differs, rather than the cells, among the various kinds of cartilage.

In articular cartilage the cells are oval or roundish, dispersed in groups through a nearly homogeneous intercellular substance. The cells measure from the 1300th to the 2000th of an inch. In the interior part of the incrusting cartilages the cells usually assume a more or less linear arrangement. In the different cartilages the cells vary in size and form.

The distinctive property of cartilage is elasticity, on which depends the specific use of this substance in the economy. It is mainly an adjunct to bones. Covering their extremities, or interposed between layers of bony fibres, without in the least diminishing the firmness and strength of the osseous fibres, it enables the bones to yield in the shocks to which the body is exposed in the movements of the frame, defends them from fracture and displacement, and at the same time protects the great centres of the nervous system, the spinal cord, and brain from the concussions and jars to which these tender and delicate organs would, but for its interposition, have been constantly exposed. In the fœtus all the bones exist first in the form of cartilage, osseous tissue replacing the cartilage bit by bit. Cartilage is a valuable food, especially that at the ends of young bones. Smith ("Foods," London, 1880) estimates its value as one-third of beef as to carbon, and one-sixth as to nitrogen; and yet gristle and bones are habitually wasted.

CARTMEL, a market-town in the county of Lancaster, on Morecambe Bay, 250 miles from London, and connected with Lancaster, 10 miles distant, by the railway that now crosses the sands of Morecambe Bay. The station is at Carl. The church is a large handsome cruciform building, in the Early English style, with a central tower. It is said to be the only conventual building in Lancashire that escaped mutilation at the dissolution of the monasteries. In the vestry are some rare books—a Bible printed at Basel in 1511; an edition of Thomas Aquinas, printed at Venice, 1506, and other valuable volumes. The priory was founded in 1188. A medicinal well, known as the Holy Well, is in the vicinity. Cartmel is the chief place of a rich agricultural district. The population of the parish in 1883 was 5600.

CARTOON (from Ital. *carta*, paper; *cartone*, large paper), a word used by artists to signify the full-sized drawings or studies made in chalks or body colour (*tempera*, as it is called in Italy), preparatory to executing any great work either in oil colour or fresco. Cartoons are also made when the design is to be copied in tapestry.

The great masters seldom commenced any extensive picture without first making studies or cartoons in *Chiaroscuro*. Many of these by Raphael, Andrea Mantegna, Domenichino, the Carracci, and others remain to attest the laborious diligence and care with which their great works were accomplished. By this means the composition, drawing, expression, and light and shade were all perfected before the colouring of the picture was attempted.

The finest specimens of cartoons that are known are those executed by Raphael, which were sent to Flanders,

in the reign of Pope Leo X., to be copied in tapestry, in two sets. The tapestries (only shadows of Raphael's exquisite designs) were finished, and one set is now in Rome. They are what are called Gli Arazzi in the Vatican.

The cartoons, originally twenty-five in number, were left neglected at Brussels, and most of them seem to have been lost or destroyed. A few, however, escaped this fate, and seven are now in the South Kensington Museum in England. Their history is eventful. They were bought in Flanders by Rubens for King Charles I. At the dispersion and sale of the royal collection, the cartoons were secured to the country by purchase, by Cromwell's particular command; at which time, we are told, the "Triumphs of Julius Cæsar," by Andrea Mantegna (still preserved at Hampton Court), were valued at £2000, while the cartoons of Raphael were estimated at only £300. In the reign of Charles II. they were again consigned to neglect. They had been sent to Mortlake to be copied in tapestry, when they were seriously injured. William III. had them repaired, and built a gallery at Hampton Court for their reception. George III. removed them to Buckingham Palace, and subsequently to Windsor Castle. They were again removed to Hampton Court, and subsequently to South Kensington, where they now are.

CARTOUCHE is the name given to the elliptical figure inclosing the title of the Egyptian kings in his hieroglyphs. The scrolls often seen on modern tombs, bearing inscriptions, bear the same name. The word (French) means simply a roll of paper; converted into *carton*, and thence to *cartridge*, it has come to indicate the bearing of a rifle, bullet and powder together, inclosed in a stout paper.

CARTTRIDGE, a cylindrical case containing a charge of gunpowder or shot, or of powder and a ball, for firearms. The cartridges chiefly used in the British service were designed by Colonel Boxer, of the Royal Woolwich Arsenal, and are specially intended for breech-loading fire arms. They are remarkable for simplicity, safety from premature or accidental explosion, and readiness to drop. They are made on the central fire system; that is, ignited by a blow on the centre. The case, instead of being formed of paper, is formerly, is made of thin sheet brass, rolled into a hollow cylinder, one end of which receives the bullet, the other end fitting into a metallic cap, which contains the ordinary percussion arrangement.

CARTWRIGHT, EDMUND, the inventor of the power loom, was born 24th April, 1733, at Marnham, Nottinghamshire. He was educated at Wakefield and at Oxford, and became a fellow of Magdalen College. He afterwards held the living of Bampton, near Chesterfield, and subsequently that of Goulby Manor, in Leicestershire. In the summer of 1784 his attention was accidentally called to the subject of mechanical weaving. Dr. Cartwright's attention had never been directed to mechanical inventions, but by the following April he was enabled to produce his first power loom, which, though an extremely rude machine, soon received many valuable improvements. Its first introduction was opposed both by manufacturers and their workmen, owing to various prejudices; and a mill containing 500 of his looms, the first which had been erected, was wilfully burned down in 1791. With various improvements, however, it continued to force its way into use. In April, 1790, Dr. Cartwright took out a patent for combing wool; altogether he obtained ten different patents for inventions and improvements of various kinds. In 1800 Parliament granted to Dr. Cartwright, who had hitherto derived little advantage from his inventions, the sum of £10,000 for "the good service he had rendered the public by his invention of weaving." This was less than he had expended on his projects, but it enabled him to pass the rest of his life in comfort. He died 30th October, 1823.

CARUCATE, in the feudal ages, a plough land or carve of land about 100 acres in extent. The term is often used

in Domesday books, and frequently mentioned by mediæval writers, some of whom say that it was as much land as could be tilled in a year by one plough. *Carucage* was a feudal tribute imposed on every plough for the service of the lord.

CARUN' CULA, a name applied by botanists to protuberances found occasionally surrounding the hilum of a seed. It is sometimes also called a strophole. Parts of this kind occur on the seeds of the caper spurge (*Euphorbia Lathyris*).

CARUS, MAR'CUS AURELIUS, Prefect of the Prætorium under the Emperor Probus, was elected emperor by the soldiers after they had murdered Probus, A.D. 282, in his camp near Sirinium in the Ilyrium. Carus was a native of Narbo in Gaul, and a Roman citizen by birth. He made war against the Sarmatians, and defeated them. He rigorously restored the old Roman discipline and simplicity of manners. He marched next against the Persians, A.D. 283, and took with him his younger son Numerianus, leaving his elder son Carinus to administer Italy and the other provinces of the west in his absence. Carus overran Mesopotamia, and took Seleucia and Ctesiphon, after which, as he was exempted beyond the Tigris, a great thunder-storm arose, and it was reported that the emperor was killed by lightning; the servants upon this carried to his tent and his body was consumed. He was succeeded by his two sons Carinus and Numerianus. Numerianus died on the way toward Munich, and Diocletian was elected emperor by the army (289). Carinus marched into Mesia to oppose him, and utterly defeated him; but in the moment of victory was slain by an officer whose wife he had seduced. Diocletian succeeded him (285).

CARV' ING, the art of shaping or decorating any hard materials by means of sharp instruments. It is usually understood to refer exclusively to works in ivory or wood, to distinguish it from carving in marble or steel, which comes under the term *sculpture*, or in metals, when it is called *chasing*. The ancients used ivory to a great extent in works of art, and its men with gold, carved by the *Greeks* *chryseiphrontes* sculptors, was favoured by the greatest artists. In later times carving in ivory has been confined to smaller objects. Wood carving is every description was a favourite material for carving in ancient times, and, after clay, was the most common material for imitative art. Owing probably to its portability, however, few specimens of ancient wood carving have been preserved, whilst carving in ivory of immense antiquity has been dug up in Egypt, Assyria, and other places. In the British Museum are preserved two figures with decorated ivory ribs attributed to the age of Moses. In China and Japan the present day wood carving exhibits in carving the same material, but the display of the art is thought to surpass the natives of both these countries in dexterity.

For a long period in modern times there was a great demand for fine wood carving. The elaborately worked Gothic screens, choir seats, and desks, in most of our cathedrals and colleges, cupboards, frames for doors and picture cabinets, and indeed every description of furniture, are evidence of the extent to which it was employed, and of the skill of our artists. One of the most eminent modern carvers in wood was Grubling Gibbons (1618-1721), a native of England.

As one of the mechanical necessities of the present age may be mentioned that of *carving by machinery*, which is effected by the precise and uniform action of steam power, and assists the carver in accomplishing those parts of his work which require neat cutting and beautiful design. The process was patented by Mr. Jordan, and was brought extensively into operation at the Houses of Parliament, where a considerable quantity in one pattern was required. The machine resembles the swing or planing machines in this—that the tools are fixed, while the wood is fed or conducted up to it. A pattern of the work to be carved is

modelled by the artist, and it can then be copied by the machine in wood with perfect accuracy, and in such a manner that two or three imitations are made simultaneously. The carving thus prepared is sent back to the artist, who introduces by hand the finishing touches.

CARY, REV. HENRY FRANCIS, was born at Birmingham in 1772, and was entered a commoner of Christ Church, Oxford, in 1790. In 1797 he became vicar of Bromley Abbat's, in Staffordshire. In 1805 appeared his still excellent translation of the "Inferno" of Dante in English blank verse, accompanied with the original Italian; and in 1811 his entire version of the "Divina Commedia." It must, however, be considered as a defect detracting materially from its claim to be regarded as a faithful representation of the "Divina Commedia" that it is in blank verse; rhyme is an essential element of the spirit and character of Dante's poetry. Towards the close of his life he received a pension of £200 a-year from the government. He died in 1844, and was entered in the Poets' Corner, Westminster Abbey.

CARYA. See **HICKORY**.

CARYAT'IDES, female figures employed in architecture in place of columns. Vitruvius attributes the origin of Caryatid figures to the circumstance of the inhabitants of Caryæ, a city of Peloponnesus, taking part with the Persians during the invasion of Xerxes, and their consequent punishment: the men were slain, and the women carried into captivity, and their ignominy was perpetuated by the employment of figures, similar to the women of Caryæ, in place of columns. The use of Caryatid figures appears to be more ancient than the date of the story told by Vitruvius. Like many other forms of art, they were most probably drawn from Egypt. Six beautiful Caryatid figures were employed in the southern portico of the Pantheon, one of the temples on the Acropolis of Athens. They were placed upon a basement, and supported an enriched entablature. One of the figures is now in the British Museum, among the Elgin collection. The execution of this figure is very fine; its height is 7 feet 9 inches.



Caryatid figure, from the Pantheon.

CARYO'CAR is a genus of plants which yields the butter-nuts of the fruiterers' shops. *Caryocar butyrosum* is a large tree with a trunk 80 feet high and 3 feet in diameter. The bark is grayish; the wood reddish, hard, and compact. The berries are covered by a rind which is 2 or 3 lines thick, and consists internally of a buttery yellow substance which melts between the fingers, and which is sometimes used in cooking instead of animal butter. Under the rind lies a stone covered all over with slender strings, which separate easily, but become very troublesome to those who open the stones; within is a kidney-shaped kernel, covered with a brownish membrane, and very good to eat; it is commonly served at table. It is cultivated in Guiana. *Caryocar tomentosum* has butter-nuts which are without the stinging hairs. *Caryocar nucifera* bears what are called the Sawarow, or, more properly, Saouai nuts of commerce. This tree is 100 feet high, with very durable wood, which is used for shipbuilding.

The genus *Caryocar* belongs to the *Rhizophoræ*, a tribe of the order *Tripluridiales*. There are eight species, all natives of tropical America. They are trees with digitate, opposite leaves, and flowers with free petals, many

stamens, and four to six long styles. There is scarcely any albumen in the seeds, the radicle filling up nearly the whole space, and the tiny cotyledons fitting into a groove in the radicle.

CARYOPHYLLÆÆ is an order of plants the type of which may be considered the *Dianthus Caryophyllus*, or common garden pink. The species are in many cases mere weeds; in no instance have they properties of any importance, being mostly inert, but they are occasionally objects of cultivation on account of the prettiness of their flowers.

This order belongs to the Caryophyllinæ, a cohort of POLYPETALÆÆ. Twelve hundred species have been described. They are found in the greatest numbers in the extra-tropical regions of the northern hemisphere, extending even to the Arctic regions and the tops of the Alps. They are rarer in the southern hemisphere, and seldom occur in the tropics, except on the mountains. They are herbs with opposite entire leaves, and stems often swollen at the nodes, and sometimes jointed. If stipules are present, they are of scarious texture. The petals are the same in number as the sepals, but are sometimes wanting. The stamens are definite in number, and the ovary has a central placenta. There are three tribes—Sileneæ, Alsineæ, and Polycarpææ. In the first, the Sileneæ, the sepals are united; in Alsineæ and Polycarpææ they are distinct, but in the latter the petals are very small and the style is simple at the base.

CARYOPYSIS is the name given in botany to the ripe fruit of wheat and other grasses, which is one-celled, one-seeded, with the membranous pericarp inseparable from the testa of the seed.

CARYOTA is a genus of PALMS. The best known species, *Caryota urens*, is a native of most of the tropical parts of Asia, especially in mountainous situations, where it grows to be one of the largest of the palm tribe. Its trunk is 60 feet high, thick in proportion, and slightly marked with annular scars, produced by the fall of its leaves; its wood is so hard as to be cut with some difficulty, and it is consequently of considerable value, provided the soft sap-wood in the centre is scraped away. The fruit is one-celled, roundish, about the size of a plum, with a thin yellow rind, so acrid that it produces a severe sensation of burning if applied to the skin, and hence its name *urens*. The tree is highly valuable to the natives of the countries where it grows in plenty; it yields them, during the hot season, an immense quantity of toddy, or palm-wine. The pith, or farinaceous part, of the trunk of old trees is said to be equal to the best sugar; the natives make it into bread, and boil it into thick gruel. The valuable Kittul fibre is obtained from the stalks of the leaves of this tree.

The genus *Caryota* is nearly allied to the *Areca palm*. The flowers are rather large, green or purplish; male and female distinct, on the same or different spadices. In the male flower there are three sepals and several stamens. In the female flower the ovary is three-celled; the fruit globular, with one or two seeds, and the stigma terminal. The seeds have a ruminated albumen.

CASAS, BARTOLOMME O DE LAS, was born at Seville, of a noble family, in 1471. When he was about twenty he accompanied Columbus in his second voyage to the West Indies. On his return to Spain he entered into holy orders, and after some years went back to Hispaniola, where he found the Indian population cruelly oppressed by the Spaniards. Las Casas devoted himself to the mitigation of the sufferings of this devoted race; and his exertions were to some extent successful as far as regarded the law, but the demand for labour occasioned continual infractions of the rules laid down. To remedy this, it is said, Las Casas suggested that the African blacks were a much stronger race than the Indians, and might make a good

substitute. This has been made a ground of reproach against the memory of Las Casas, but the fact is doubtful. Unable to effect the good he wished by his oral remonstrances, Las Casas had recourse to his pen, and published three treatises in favour of the Indians, of whose sufferings he gave an appalling picture. He next formed a plan for transplanting the natives of Hispaniola to Cumana on the adjacent continent; he accompanied a number of them, but the project failed, and Las Casas returned to Hispaniola, where he took refuge in the convent of the Dominicans, whose order he entered in 1522. Some years afterwards he returned to Spain, and made a fresh appeal to Charles V. in favour of the oppressed Indians. Las Casas was subsequently appointed bishop of Chiapa in the newly conquered empire of Mexico. After remaining for many years in his diocese, ever intent on mitigating the sufferings which the natives endured from the conquerors, Las Casas returned to Spain in 1551, having resigned his bishopric, and died in a convent of his order at Madrid in 1566. He is introduced in Sheridan's once famous play "Pizarro."

CASAUBON, ISAAC, a distinguished French scholar, was born at Geneva, on the 8th of February, 1559. His father and mother were natives of the Dauphiné, and, being Protestants, were obliged to retire to Geneva to avoid religious persecution. They remained, however, after the persecution ceased, to Crest, a small town of Dauphiné, of which his father was appointed minister, and here Casaubon studied under him till his nineteenth year. He then went to Switzerland to attend the lectures of Francis Partner, a Cretan, professor of Greek at Geneva, whose death succeeded on his death in 1582. In 1584 he married Henriette, daughter of the learned printer, Henri Estienne. He removed to Montpellier towards the end of 1586, having been appointed professor of Greek there. In 1597 Henry IV. sent for him to Paris, and in the following year appointed him one of the Protestant judges in the controversy between Du Perron, bishop of Lyons, and Du Plessis-Mornay. In 1603 he succeeded Gesselin as sub-bibliothecary to the king, but on the death of Henry IV. in 1610, he went over to England with Sir H. Wotton, the English ambassador, James I. received him with great distinction, and conferred the highest distinction on him by a translation. He was appointed prebendary of Canterbury and Westminster, and was also given a prebend in 1609. He died on the 1st of July, 1644, and was interred in Westminster Abbey, where a monument was erected to his memory. His most important works are his editions of Athenæus and of Polybius, both of which show great erudition and involved great labour; he also wrote commentaries on Aristotle, Theophrastus, Theophrastus, Ptolemy, Strabo, Pliny the Younger, &c., and treatises on Greek and Roman satire. An excellent Life of Casaubon, by Mark Pattison, rector of Lincoln College, Oxford, was published in 1875.

CASCA, P. SERVILIUS, tribune of the plebs at Rome in B.C. 44, would need no mention in so general a work as the present, were it not that Shakespeare has made him take so prominent a part in his masterpiece, "Julius Cæsar." He and his brother Cilius were both in the conspiracy against the great dictator, and Publius Casca was the first to strike him. "See what a rent the evil-doer Casca made!" cries Mark Antony, showing the gashes in Casca's mantle. Casca fought along with Brutus and Cassius at Philippi, and died (possibly by his own hand) shortly after the battle, in B.C. 42.

CASCARILLA, a name given by the Spanish Americans to all kinds of tonic barks, and especially in Peru to the different kinds of cinchona; but in England this word is confined to one kind of bark imported from the capital parts of America, and used medicinally as a valuable aromatic and tonic. It arrives in Europe in short, thin, brittle rolls, whence its name (*cascara*, bark; *cascarilla*, little bark). This cascarilla bark, or sweet-wood bark,

is the product of *Croton Eluteria*, one of the Euphorbiaceæ. This plant is a native of the Bahamas and Cuba, and most of the bark is imported from the town of Nassau. The bark is aromatic, bitter, and tonic, and is used sometimes in place of quinine, especially in convalescence after fevers. It is chiefly used, however, in atonic dyspepsia, bronchial affections, and dysentery.

Croton Eluteria is a small tree about 20 feet high. The leaves are lance-shaped, thickly covered below with silvery scales, which are bronze-coloured in the centre; the scales on the upper surface are comparatively few, and quite white. The flowers are deliciously sweet scented, monœcious, in erect racemes.

Cascarilla is the name given to a genus of trees nearly allied to Cinchona, but not containing quinine.

CASE-HARDENING is the process of imparting a steel surface to iron goods. There are various methods of accomplishing this, but however much they may differ in detail, the object common to all is to cause, by means of heat, carbon to combine with the outer part of the iron; a coating of steel, seldom more than $\frac{1}{16}$ of an inch thick, is thus produced. The thickness of the steel can be increased by repeating the process several times. Iron treated in this way becomes much more durable than before, and takes a better polish; the process is therefore extensively resorted to in the case of the gates, &c.

CASE-SHOT, a form of projectile which is discharged from pieces of ordnance against an enemy at close quarters. A number of hardened leaden bullets or balls of wrought iron are encased in a cylinder of thin sheet iron, and when the projectile is fired from a rifled gun the outer casing is torn off by the explosion, and the bullets begin to scatter immediately on leaving the gun. As they soon lose all regularity of motion their effective range does not exceed 500 yards. For longer distances shells of stronger construction, carrying a bursting charge of powder and filled with a time or percussion fuse, are used. An amount of charge that will just burst the shell, without scattering the balls very widely, is preferred by gunners.

CASEIN is the essential constituent of cheese. It can be readily obtained by throwing down the curd from milk with rennet (dried calf's stomach) or an acid, and then washing it repeatedly in pure water. It is the sole source of the nitrogen whose plentiful presence makes cheese so valuable an article of food. According to Dr. Smith, its composition, per 100 parts, is as follows:—

Carbon . . . 53.83	Oxygen . . . 22.52
Hydrogen . . . 7.15	Nitrogen . . . 1.65

It closely resembles albumen in many properties; is a curdy white substance, soluble in alkaline water, but not in pure water nor in alcohol. Certain pastures, and still more certain breeds of cows, produce specially large quantities of casein in the milk, and hence large quantities of cheese; and these are naturally in great demand in cheese-making districts. See CHEESE.

CASE MATE (from the Italian *ca-matta*), a vault of stone or brick work, frequently built in the thickness of the parapet of a fortress for the reception of artillery which is to be fired through embrasures pierced for the purpose in the front of the vault.

The solidity of the rocks in the ancient bastions, and consequently the insufficiency of the fire from their parapets, gave rise to the invention of casemates, which, being formed under these parapets, augmented the means of defending the ditches without rendering any change necessary in the size of the work. Casemates so situated appear to have been executed as early as the sixteenth century. The smoke arising from the discharge of artillery in casemates soon causes great inconvenience; they are now therefore frequently made open towards the rear, and with air-holes in front.

The term casemate is also applied to the shell-proof

vaults of stone or brick constructed in fortresses to protect the troops, provisions, and ammunition. These are usually formed on the fronts which are least exposed to the enemy, and within the masses of the ramparts, in order that they may be sufficiently protected from the effect of shells falling on them. Those at Gibraltar are from 16 to 18 feet wide in the interior, and 16 feet high from the floor to the crown of the arch, which is semicircular, and they are from 40 to 100 feet long. The vaults of the casemates on the western heights at Dover are parabolical; the whole interior height is 17 feet, and the breadth 18 feet.

CASERTA, a town of Southern Italy, capital of the district of Terra di Lavoro, in the province of Caserta, and 17 miles N.E. of Naples. The chief buildings are a palace, cathedral, several churches, and barracks. In the latter a large garrison is maintained. Population, 30,000. It is the see of a bishop, and near it is the royal silk manufactory of St. Leucio. The chief fame of Caserta is derived from its huge palace, in which in former times the Neapolitan court frequently resided. It was commenced in 1752 by Vanvitelli, by order of Charles III. Its form is a rectangle, and it is built of travertine from the quarries of St. Jovio, near Capua. The south side is 830 feet long and 134 feet high, with thirty seven windows in each story. The courts of the palace are traversed by a colonnade, from the centre of which ascends the handsome marble staircase, with 116 steps. Within it is a chapel, lavishly decorated with marble, imitation lapis-lazuli, and gilding; and a theatre, in which are twelve Corinthian columns of African marble from the Temple of Serapis at Pozzuoli. The gardens are very fine and extensive, and from the grand terrace there are some beautiful views over the surrounding country. The "English garden" was made in 1782. In the botanical garden many trees from colder climates are successfully cultivated. Water is supplied by means of an extensive aqueduct. The palace is said to be one of the finest in Europe, though it is perhaps distinguished more by its size and lavish ornamentation than by any true architectural beauty.

In 1860 Caserta was used as headquarters by Garibaldi and his army. *Caserta Vecchia*, the old Caserta, is 3 miles N.E. of the modern town. It was a Lombard town of the eighth century.

CASH'EL, a former parliamentary borough in the county of Tipperary, Ireland, 105 miles from Dublin, being 6 miles from the Goodcross station on the Great Southern and Western Railway; it was formerly the see of an archbishop, but is now included in the archbishopric of Dublin and Cashel, and in the united bishopric of Cashel, Emly, Waterford, and Lismore. The town is chiefly built round the S. and E. sides of an insulated mass of perpendicular limestone, called the Rock of Cashel ("the outpouring of the devil"), where formerly stood the residence of the kings of Munster, and which is now the site of the most interesting group of ruins in Ireland, consisting of a round tower, the old cathedral, a castle, Cormac's chapel, and a monastery. The round tower is 56 feet in circumference at the base, and 90 feet high. The cathedral, a fine specimen of pointed Gothic architecture, contains many curious relics. It was burned down by the turbulent Earl of Kildare, who, when accused of the crime, coolly acknowledged it, saying that he "would not have done it if he had known that the archbishop was *not* inside." In complaining of this outrage, to King Henry, the Bishop of Meath concluded with the words—"You see all Ireland cannot rule this gentleman;" which brought the reply from the king—"Then he shall rule all Ireland," and he was forthwith appointed to the lord-lieutenancy. The chapel of Cormac MacCullinan, king of Munster, built in 1136, is a good specimen of Early Norman architecture. The cathedral, Cormac's chapel, and the castle are all joined together. The monastery is a few yards distant. In 1647 Lord Inchiquin stormed the rock,

and put to death all the clergy he could find. In the cemetery adjoining the cathedral is the famous "Cross of Cashel," on which is sculptured an effigy of St. Patrick. There is also a stone, not far from the round tower, on which it is said the old Irish kings were crowned. The original coronation stone, the tradition states, uttered a groan when pressed by any one of royal blood. It was lent to King Fergus, who crossed over to Scotland, carrying it with him, and never returned it. It is now in the coronation chair at Westminster Abbey. The round tower and the chapel are ascribed to Cormac MacCulinan, who was both king and archbishop of Cashel. He was born in 837, and composed the celebrated "Psalter of Cashel" and a history of Ireland. The town contains a court-house, market-house, county infirmary, union workhouse, modern cathedral, large Roman Catholic chapel, and Episcopal palace. The main and one or two other streets are well built and clean, and contain some good houses; the rest are narrow and dirty. Population of the town, 3961. There are no manufactures of importance, but the town is the market for an extensive agricultural district, and has a good retail trade, a large number of gentry residing in the vicinity. The parliamentary borough returned one member to the House of Commons until 1870, when it was disfranchised for wholesale bribery. The surrounding country produces fine wheat crops. It was at Cashel that Henry II. received the homage of O'Brien, king of Limerick, and Edward Bruce held his Irish parliament. In 1172, at a great synod held here, the Irish prelates first acknowledged the authority of the English king and church. About 6 miles to the west, close to the borders of Cork, are the extensive limestone caves of Mitchellstown, which were only discovered about half a century ago. There are twenty-four large halls and chambers, connected together by galleries, and incrustured with stalactite and stalagmitic formations. Altogether upwards of 3 miles of galleries have been explored.

CASHEW-NUT TREE (*Anacardium occidentale*) is a small tree found over all the West Indies, where it is much cultivated for its bunches of fragrant rose flowers, as well as its fruit. Its stem, if wounded, yields abundantly a milk, which, when inspissated, becomes intensely black and hard, besides which it secretes a gum not inferior to gum-arabic. The nut is a kidney-shaped body, containing in abundance, beneath the outer shell, the black caustic oil of the order, which, when volatilized by heat, as happens in the process of roasting, is apt to produce erysipelas and other disagreeable affections in the face of persons standing over the fumes; it is used as a varnish. The kernel is a wholesome article of food when roasted; in the West Indies it is used as an ingredient in puddings, and is also roasted for the purpose of mixing with Madeira wine, to which it is thought to communicate a peculiarly agreeable flavour. The fruit is kidney-shaped, and is remarkable for being placed at the end of a receptacle very much larger than itself, and looking like a red-striped pear. See ANACARDIACEÆ.

There are five other species of *Anacardium*, natives of tropical America. They are shrubs or trees, with simple alternate leaves; the flowers have a deeply divided calyx of five segments, eight to ten stamens, a stalked receptacle, and a filiform style.

CASHIERING is the punishment usually inflicted upon officers of the army or navy who have been found guilty by a court-martial of "scandalous and infamous conduct." It implies dismissal with ignominy from the service and disqualification for ever again entering it. Cashiering comes immediately from the German *cassiren*, with the same sense; and this latter is derived from the French *casser*, to break. In fact our old English military term was, "he was broken for such an offence." The origin is, of course, the Late Latin *cassare*.

CASHMERE, the name given to an extensive tract of country reaching from the Punjab on the S. and W. to Tibet on the N. and E., its extreme length being about 400 miles, and its breadth 280. The boundary of this territory on the N. and N.E. is undefined, or unknown. The country is about the grandest alpine region in the world, and embraces within its borders a great variety of climatic, physical, and ethnical conditions, stretching as it does from the hot plains of the Punjab to the eternal snows and glaciers of the Western Himalayas and frontier Karakorum ranges, and from the Hindu-Kush eastwards to Tibet. It is essentially a highland region, almost everywhere mountainous, but having one splendid valley (Cashmere), broad, long, and populous. Moreover, there are many broad upland valleys, extremely fertile, well sheltered by the towering Himalayan crests from the northern blasts, and watered by copious streams all draining to the Indus or to its tributaries.

Physically speaking, the whole country may be divided into three zones, rising in successive terraces from the Punjab lowlands to the Karakorum range. The lowest and southernmost of these zones comprises the more advanced hilly districts, with a mean elevation of 2250 feet above sea level. This is succeeded by the central zone between the Himalayas proper and the Kailas range, from 7000 to 9000 feet high, beyond which follows the truly alpine region of Baltistan, or "Little Tibet," between the Kailas and Karakorum, with a mean elevation of 11,000 feet, and culminating with the snow-capped peak K² (28,278 feet), next to Mount Everest the highest point on the globe. Here also are the Baltoro and many other glaciers, which, vast as they are, seem to be but the poor remains of the prodigious ice-fields which must have formerly covered the whole region of the Himalayas. The melting of the snows in the fierce summer sun, combined with the precipitous slopes and the silent action of underground waters, exposes all these upland valleys to sudden floodings, avalanches, and landslips, often causing widespread ruin.

In the central zone lies the lovely vale of Cashmere, 1500 square miles in extent, hemmed in on all sides by snow-clad peaks, and watered by the placid winding course of the Jhelum. Thus pent up, and with an elevation of over 5000 feet above the sea, this romantic valley presents somewhat the appearance of a vast cirque with a narrow southern outlet, through which the Jhelum escapes towards the Indus. Cashmere has ever been the theme of Eastern song—an earthly Eden, where prevails a perennial spring, and of which the Mogul emperor, Shah Jahan, was wont to say that he would prefer to sacrifice all his vast Indian dominions rather than be deprived of this delightful retreat. Here the picturesque elements are the snowy peaks, the romantic gorges, the numerous lakes, streams, and waterfalls, the magnificent woodlands, and rich flowery meads—a combination of natural beauties scarcely to be found elsewhere concentrated in an equal area.

Of the numerous passes leading into the Cashmere valley, and practicable in the summer for pack animals, the chief are the Banihal (9700 feet) from the south, the Punch (8500) from the west, and the Pir Panjal (11,500) from Gujarat in the Punjab. These passes, however, are too lofty for use in the winter time, when the only way through which this secluded region can be reached from the plains of the Punjab is the defile through which the Jhelum effects its escape, and this single opening will not admit of a wheeled vehicle.

The Jhelum drains the whole valley; its remotest source is a small pool on the further side, from which it flows with a gentle current, in snake-like curves, spreading out in places into several lakes, the largest of which, Lake Wuller, is about 10 miles in length by 5 in breadth. The low grounds have the mulberry, chestnut, walnut, poplar, and plane tree, groves of which were planted by the Mogul

emperors, who made this region their summer residence, adorned it with palaces, gardens, summer-houses, and luxurious retreats, the ruins of which attest their taste by the picturesqueness of the sites. Orchards of apples, pears, and cherries abound, and almost every variety of fruit known in Europe flourishes, with the exception of the orange, the lemon, the fig, and the olive. Rice and maize are the principal objects of cultivation. The wild animals include the ibex, stag, and bear, the first of which is found only in the wildest and most inaccessible parts of the country. In various localities the shrill whistle of the marmot is almost constantly heard over the barren rocks. The beautiful men and other pheasants are abundant, with the red-legged and snow partridge. In winter the temperature is severe, and the snow lies deep; in summer the heat is occasionally oppressive, but generally moderate. Leather manufactures, weaving the famed Cashmere shawls, and the preparation of ottar of roses, with bee keeping, are prevailing industries. In recent times the story of this high-land district has not been that of the Happy Valley. It fell under the power of the Sikhs in 1819, and was soon afterwards terribly desolated by an earthquake, a pestilence, and a famine caused by the failure of the rice harvest. Upon the conquest of the Sikh kingdom by the British, it was ceded by them as a separate state to Gholab Singh, who had conquered an adjoining portion of Tibet. The people are a fine race in personal appearance, and consist chiefly of Mohammedan Hindus. *Srinagar*, the capital, often called *Cashmere*, near the centre of the valley, is seated on both banks of the Jhelum. The entire valley of Cashmere is traditionally believed to have once been a great upland lake, a persuasion which various natural appearances confirm. Small lakes are numerous at present, especially around the capital, liable to inundation from the joint effect of the melting of the winter's snow and the copious spring rains. To counteract in some degree this disadvantage, the curious expedient is resorted to of forming floating gardens on the surface of the water, which rise and fall with it, and thereby place the produce out of danger from any overflow. They are made by cutting through the reeds, sedges, lilies, and other aquatic plants, about 2 feet below the surface, which are pressed into closer connection, become matted together, are arranged into a number of small beds, upon which a thin coating of mud is laid. The beds float, but are kept in place by willow stakes, which admit of a change of level according to the action of the water. These gardens are cultivated by men in boats, who in the same manner gather the crop, chiefly cucumbers and melons, though the beds are often compact enough to bear the weight of a man.

Genuine Cashmere shawls, though not in such demand as formerly in Europe, owing to excellent French and other imitations, are still in repute, and furnish employment to a large proportion of the population. The number annually produced—plain and variegated, fine and inferior—is stated to be 30,000, the work of 16,000 looms. Those of the best quality, which have realized prices of £100 and upwards, owe their superiority to the fineness of the texture, the firmness of the colour, and the patient industry of the workmen, for they are woven in rudely-constructed looms. Three or four men will be engaged a whole twelvemonth in weaving a single pair. The shawl goat, which yields the material for its long silky hair, inhabits the high table-lands of Tibet, and is of singularly long horns of great length, flattened, and wavy. Our word "shawl" is a corruption of the native name of the fabric, *dachala*.

History.—The history of Cashmere goes back to an early age. Herodotus states that it formed, along with a portion of Upper India, the twentieth satrapy of the Persian empire in the reign of Darius Hystaspes. It is mentioned by Strabo, Pliny, and Ptolemy. The last very accurately describes the position of the valley. It appears

to have long remained the seat of an independent Hindu kingdom, and had next a series of Mohammedan rulers, who held possession down to the year 1586, when it was reduced by the Mogul emperor Akbar, and added to the empire of Delhi. That prince and his consort, the peerless Noor Mahal, favoured the district, and strove to render it paradisaical, as also did their successors. Shah Jehan constructed the celebrated Shalimar Gardens, eulogized by poets and travellers. Serais, or halting-places, were established on the way at convenient distances. The royal progresses required providing for. Bernier, the French physician, who accompanied Aurangzeb in 1661, states that the imperial cortege consisted of 35,000 horse and 10,000 foot, with seventy pieces of heavy cannon, and from fifty to sixty pieces of stirrup artillery, as it was called. The route commonly taken was that of the Pir Panjal Pass, the most direct, but one of the loftiest (11,500 feet above the sea), yet the most frequented in summer. A good road across the mountains is said to have existed in those days. The route is still called the "Emperor's Highway."

When the Mogul empire was destroyed, about the middle of the last century, Cashmere was taken by the Afghans, who remained in possession of it till it became a part of the extensive dominions of the Maharajah Runjeet Singh, sovereign of Lahore. After the defeat of the Sikhs in 1816, the British government transferred Cashmere to Gholab Singh, who had already conquered an adjoining portion of Tibet. The population, reduced very considerably during this century by oppression, pestilence, and famine, only amounts to 200,000.

CASHMERE or CACHEMIRE, a peculiar textile fabric formed of the fine downy wool found about the roots of the hair of the Cashmere goat, and so called from the original seat of the manufacture, the valley of Cashmere, in the north-west of India. Shawls of exceedingly delicate quality are the principal articles manufactured of this material; but a cloth woven in imitation of them is also made, and called by the same name, *Cachemire*. *Kersey-mere*, the fine woollen cloth, is derived from "Cashmere," so far as its name goes, the Anglicised "cassimere" being confused with a noted native cloth of Kersey. Like *Worsted* in Norfolk, so also *Kersey* in Suffolk gave its name to the local woollen manufacture; "cassimere" thus became by confusion "kersey-mere"—but whereas Kersey was a coarse woollen, kersey-mere is very fine.

The process is exceedingly slow, the weaving of a pair of shawls, or, as some writers have it, of a single shawl, often employing three men with a clumsy old-fashioned loom for a period of twelve months; and, owing to the numerous heavy duties charged upon the shawls between leaving the loom and reaching a purchaser in this country, the price of real Cashmere shawls of the best quality is very high. They have frequently been sold in London at from 100 to 400 guineas each.

Various attempts have been made to naturalize the Cashmere goat in this and other European countries; but as the peculiarities of its wool appear to be dependent upon climate, the perfect success of any such attempt is problematical. The weaving of shawls from Cashmere yarn imported from France was, early in this century, an important branch of manufacture, and in 1832 the manufacture of yarn from the raw material on the French system was successfully established in Scotland.

CASHMERE GOAT is a variety of the common goat (*Capra hircus*), noted for its long and peculiarly fine and silky hair. It especially abounds in Tibet, from which most of the hair used in the manufacture of the celebrated shawls is obtained. The fleeces of ten goats are required for one shawl. Attempts have been made to introduce the Cashmere goat into Britain, but without much success. A cross between the Angora and this variety is found to produce the best hair in this country.

CASIMIR (kings of Poland). See **POLAND**.

CASPIAN SEA is properly an inland sea in Asia. It extends from $47^{\circ} 20'$ to $36^{\circ} 40'$ N. lat., in a straight line about 740 miles. The general direction of its length is from S. by E. to N. by W. Its breadth averages about 210 miles, and it is the largest inland sea in the world.

The Caspian Sea has very few bays. Among them are the Mertwi Kultusk, Balkan Bay, Karabog haz Bay, Astrabad Bay, and the Bay of Kuma. The shores are mostly very low, and are subject to inundation during a high wind from the sea. The peninsula of Asperon projects 40 or 50 miles into the sea on the west side. The depth in some places reaches to 600 feet; but as the sea is mostly shallow near the coasts, it is unfavourable for navigation by large ships. The water is salt, but less so than that of the ocean.

The three principal rivers that discharge into the Caspian are the Volga, the Ural, and the Kur, together draining a total area of nearly 700,000 square miles; the first two discharge into the northern part, which is extremely shallow, and is really a continuation of the Steppe. The matter brought down by these rivers is constantly raising the bottom, so that in time this part will be converted into a salt marsh. The Kuma, which is also at this end, is lost in the sands before reaching the sea. The Terik is a river which receives several torrents from the Caucasus, and discharges on the west side towards the middle. It is not far from this that the fortified pass known in ancient times as the *Albanie*, or *Caspia Pylor*, is formed by a rocky spur of the Caucasus. Still nearer the southern end, on the western side, is the mouth of the Kur, which receives a little inland the waters of the Aras or Arax, the ancient *Araxes*, which forms the boundary between Russian Transcaucasia and Persia. The south-eastern side receives the Attrak, and higher up is the supposed ancient bed and mouth of the *Oxus*, now the *Amen-Daria*, before it discharged into the Sea of Aral. Above this is the plateau of Ust Urt, which rises with precipitous sides between the shores of the Caspian and the Aral Seas to a height of from 550 to 727 feet. Several small streams discharge the waters of this plateau.

The navigation of this sea is confined to the countries lying on the western shores between the mouth of the Volga and the town of Astrabad. The Russians of Astrakhan use frigates of from 150 to 200 tons; but the Persians only small vessels, from 50 to 70 tons. The fisheries give employment to the inhabitants of the adjacent countries, who capture vast numbers of sturgeon, belugas, sterlets, salmon, and seals. On the shores naphtha is met with, and coal was discovered in 1869. Some of the lakes round the town of Baku are remarkable for the hydro-carbons rising through the water and continually burning. One called the "burning field" was an object of reverence and pilgrimage to the sect of Ghebirs or Parsees. The Caspian is united to the Baltic Sea by means of a canal, and in 1883 a line of railway was completed from Baku to Poti, by which direct communication was established between the Black Sea and the Caspian.

The Caspian appears to be subject to some extraordinary changes in the level of its surface, which have not yet been completely investigated. The depth seems to be greater at some periods than at others. There are no tides, but it is subject to violent storms. The northern portion of it is annually covered with ice. Since the middle of the last century it has been known that the surface of the Caspian Sea is lower than that of the ocean. Pallas and Engelhardt found, by barometrical measurements in 1812, that the Caspian is 301 feet lower than the Black Sea; another experiment gave a difference of 348 feet. But the more accurate experiments made by Fass, Savitch, and Sablesbar show that the depression is only 83½ feet. It is supposed that the Caspian Sea at a remote period covered

the extensive plain which lies between the most southern ranges of the Ural mountains and the Black Sea. The Caspian was known to the Greeks and Romans. Herodotus, the first who mentions it, calls it the Caspian Sea, a name derived from the *Caspi*, who inhabited its western shores. Its other names in ancient writers, Hyrcanian Sea, Scythian Sea, are also derived from the neighbouring peoples. The ancients considered it as united with the Sea of Aral, and as having its greatest dimension east and west—both probably true in very remote times.

CASSANDER was the son of Antipater, who, dying B.C. 318, appointed his friend Polyperchon to succeed him in the regency of Macedonia, instead of his son Cassander. [See **ANTIPATER**.] Cassander, finding his party too weak for successful opposition, fled to Asia, and sought assistance from Antigonus, who gave him 1000 men, with whom he sailed to Athens, and was received by Nicomachus, the Macedonian governor of Murechia. Polyperchon brought an army to besiege him, but was soon obliged to retire into Peloponnesus.

In the following year Cassander marched into Macedonia, defeated Olympias, the mother of Alexander, gained possession of Macedonia, and took to wife Thessalonice, the half-sister of Alexander. Soon after he joined the combination of Ptolemy, Lysimachus, and Seleucus, against Antigonus. The war which ensued was concluded B.C. 311, and Cassander was appointed military governor of Europe till the son of Roxana by Alexander should attain his majority. Cassander immediately putting to death the young prince and his mother, B.C. 309, Polyperchon set up another rival to him, in the person of Hercules, the only surviving son of Alexander (by Barsine), but he agreed to put Hercules to death on condition of Peloponnesus being given up to him. Hercules was accordingly murdered, but Polyperchon was not able to get possession of Peloponnesus.

In 306 Cassander took the title of king, and from this time suffered many defeats at the hands of Demetrius, son of Antigonus. The death of Antigonus at the battle of Ipsus, B.C. 301, removed Cassander's most formidable enemy, and from that time he held secure possession of Macedonia. He died B.C. 296. He was succeeded in Macedonia by Philip, his eldest son.

CASSANDRA, the propheticess whose fame and whose sad story form part of the Trojan myth. She was a daughter of Priam and Hecuba, monarchs of Troy. She haunted the temples of Apollo as a girl, and knew the voices of birds. Her beauty attracted the notice of the god himself, but although she coaxed him into conferring upon her the gift of prophecy, she resisted the demands which he made in return. Vexed at being duped, the angry god, unable to withdraw his gift, added to it the condition that Cassandra should never be believed. Thus when she foretold the ruin of Troy, no one credited her; she passed for a madwoman. Ajax, son of Oileus ("the lesser Ajax"), found Cassandra clinging to the altars of Athene when Troy was sacked, and used her violently. She fell to Agamemnon's share in the division of the booty, and prophesied his murder on his return. The usual fate of her prophecies pursued this also, and both her lord and herself met their death at the hands of the fury CRYMIDEMUS. Æschylus, indeed, makes jealousy of Cassandra the motive for the murder of Agamemnon by his wife.

CASSAREEP. See **CASSAVA**.

CASSATION ("the reversal of a judicial sentence") is a French law word, derived from *cassare*, which, in the barbarous Latin of the dark ages, meant "to break" or "to annul." [See also **CASHMERE**.] The French Tribunal de Cassation was founded in 1790, but received its full organization under Napoleon, and has ever since continued under the name of Cour de Cassation. It is the highest court of France, and receives appeals from all

other courts.⁶ It consists of forty-eight members, who, by charter of Louis XVIII., are appointed by the head of the state, but hold office for life. The court has a president, although on certain occasions the keeper of the seals, or minister of justice, has the right of presiding in it. It is divided into three sections: 1, Section des Requêtes, which examines whether the petitions or appeals are to be received; 2, Section de Cassation Civile, which decides upon appeals in civil cases; 3, Section de Cassation Criminelle, which decides upon appeals in criminal matters. The sections do not decide upon the main question, but only on the competency of the other courts, and the legality of the forms and principle of law by which the case has been already tried. If the law is found to have been violated, the sentence of the inferior court is annulled, and the case is sent to be tried again by another court. In each section the number of members required to pronounce a judgment is eleven out of the total of sixteen, the decision being determined by the majority. If this second court decides the case in the same manner as the first, and a petition against the decision is again filed before the Court of Cassation, then the three sections unite in order to examine the case anew, and, if they find reason to pass a second reversal, the case is sent to be tried in yet another court. Should this third court decide in the same manner as the other courts, and a petition against the decision be again presented to the Court of Cassation, the court requests a final explanation of the law on the point at issue from the legislature.

The institution of the Court of Cassation has proved highly beneficial to France; it has acted as a watchful guardian of the laws; it has afforded protection to the citizens against the arbitrary acts, and the misjudgments or misconstructions, of the other courts of the kingdom. Placed by the nature of its office out of the immediate influence of political passions, it has maintained its high character for strict impartiality throughout all the changes of government and administration. Many of the most distinguished jurists of France are numbered among its members.

CASSAVA (*Manihot utilisima*) is the plant from which cassava meal and tapioca are made. It is now cultivated in all tropical countries, but is probably indigenous in Brazil. The stems are slender, from 6 to 8 feet high, herbaceous, and somewhat woody below. The leaves are large, deeply divided, and pinnate. The flowers are monocious, with a deeply-cut, bell-shaped perianth. The capsule has six narrow undulating wings. The root which supplies the cassava is 3 feet long, from 6 to 9 inches thick, and filled with a poisonous milky juice. The plant known as Sweet Cassava, or Manioc, is *Manihot Aipi*, which some botanists regard as a variety of *Manihot utilisima*. It is distinguished by not having wings on the capsule, and by the roots being reddish instead of yellowish, tough and fibrous in the centre, and the juice not being poisonous. The Bitter Cassava root abounds in a highly poisonous very small doses of which produce the most dangerous consequences; it is, however, of so volatile a nature as to be entirely driven off by heat, and consequently there is no practical difficulty in procuring the nutritious substance in a pure state. In order to effect this the roots are peeled, well washed, and then ground between mill-stones till they are reduced to the state of paste. This is subjected to pressure for the purpose of depriving it, as far as possible, of the juice; the residue is placed in vessels over a moderate regular fire, and constantly stirred, until it becomes dry; it then acquires a granular appearance, is gradually cooled, and afterwards packed in barrels. From the starch which settles at the bottom when the juice is allowed to stand tapioca is made by heating the moist starch on hot plates. The juice is concentrated by heat, which also drives off the poisonous properties. It is then flavoured with aromatics to form the sauce called

Cassareep, which is an ingredient, with peppers and meat, of the West Indian "pepper pot." The poisonous properties are due to the presence of hydrocyanic acid. Sweet Cassava root is boiled or roasted like potatoes. The natives of tropical America ferment the juice and make an intoxicating liquor, which they call "piwarry." Cassava meal, starch, and tapioca are also obtained from this root. The genus *Manihot* belongs to the order EUPHORBIACEÆ.

CASSEL or **KESSEL**, a town of France, in the department of Nord, said to be the ancient *Castellum Menapiorum*, is built on an isolated conical hill 800 feet high, in the midst of a fertile and extensive plain, 6 miles by railway north from Hazebrouck, and has a college and 4216 inhabitants. The town is neat, clean, and supplied with water from an abundant fountain. The summit of the hill on which it is built is the highest point in French Flanders, and presents one of the finest views of the kind in Europe, comprehending portions of the English coast, the harbours of Dunkirk, Gravelines, and Calais, thirty-two towns, above 100 churches and clock towers, and many towns, villages, and hamlets scattered over the varied and fertile plain. Lace, linen, hats, stockings, soap, coarse pottery, leather, and oil are the chief industrial products; there is also some trade in corn and cattle. The chief buildings of Cassel include a castle, a college, a museum, and the celebrated ancient mansion known as La Noble Cour de Cassel. That it is very ancient is shown by the numerous Roman remains to be found in the vicinity, and it was probably the capital of the MENAPII when Cæsar invaded the country. It was united to France in 1678 by the treaty of Nimègue. Several battles have been fought in its vicinity. It was the birthplace of General Vandamme.

CASSEL, the capital of the province of Hesse-Nassau, and of the electorate of that name before its annexation to Prussia, stands on the Fulda. It has a population of 58,290. It is surrounded by walls on every side except that which is bounded by the river Drusel. The town consists of the Old Town, Upper New Town, and Lower New Town, and three suburbs. The Old Town is a collection of crooked, narrow, dark, and dirty streets. It contains the market-place, the *Renthof*, consisting of several public offices, and several churches. The Upper New Town is the finest quarter of Cassel, and may vie in splendour with any city in Germany. It contains several fine streets and squares; among the latter is the *Friedrichsplatz*, in which stands the elector's palace, and which is the largest square in any German town. Among other edifices in this quarter are the museum, which contains an extensive library, collections in natural history, antiquities, experimental philosophy, and a curious collection of clocks and watches, including the famous "egg of Nürnberg," &c., and an observatory; the picture-gallery, hospital, poorhouse, barracks, arsenal, mint, and opera-house, of which Louis Spohr was conductor from 1822 to 1859, &c. The Lower New Town is the site of the *Castell*, an ancient structure surrounded by walls and a ditch, for the safe custody of state and military offenders; it contains a church, an orphan asylum, infirmary, lying-in hospital, prison, &c. The town and its environs abound in beautiful promenades; and near it is the palace of *Wilhelmshöhe*, the place to which the Emperor Napoleon III. was sent by the King of Prussia after his surrender at Sedan on 2d September, 1870, and where he remained till the conclusion of the war between France and Germany in 1871. There is also here a building, called the *Loewenburg*, of the eighteenth century, which contains portraits of the Tudors and Stuarts. On the *Karlsburg* cascade is a rudely-carved stone figure of the giant *Enceladus*, and also a colossal copper figure of the *Farnese Hercules*, 31 feet high, the hollow of the club of which is sufficiently large to receive eight or ten men. In the vicinity, 2 miles from the town,

in a beautiful park, lies Wilhelmshof, formerly a chateau of the Elector of Hesse, built in 1760, containing handsome rococo decorations and many pictures by Tischbein. The Drusel is navigable, and Cassel has now considerable manufactures, consisting chiefly of machinery, cotton, silk, and woollen fabrics, leather, gold and silver articles, porcelain, dyes (especially Cassel yellow and black), soap, and chemicals. There are several breweries, and in the vicinity gunpowder, oil, and other mills. Cassel appears in documents of the tenth century as *Chassala*. During the short period that Jerome Bonaparte was on the throne of Westphalia it was the capital of his kingdom and the place of his residence. It was the birthplace of the chemists Bunsen and Kolbe.

CAS'SIA, a genus of LEGUMINOSÆ, consisting of about 400 species, chiefly inhabiting the tropical or temperate parts of the world, and including among them the plants that produce the senna leaves of the apothecaries. The species are trees, shrubs, or herbs, with abruptly pinnate leaves. The flowers are yellow, more rarely white or red; there are five sepals, imbricate in bud; five petals; ten stamens, with filiform filaments, and linear anthers, opening by a terminal pore; ovary free, with numerous ovules; seeds albuminous.

Cassia fistula is a small tree, with large yellow flowers, growing in long loose racemes, having the aspect of a laburnum. It is a native of the tropical regions of Asia, and thence has been introduced into other countries. The leaves are more than a foot long, and the flowers are of great beauty and fragrance. It is therefore planted extensively, especially in Jamaica. The pulp of the pods, in which the seeds are immersed, is viscid, with a sweetish taste. It is mildly laxative, and is one of the ingredients in confection of senna. *Cassia acutifolia*, a small under-shrub, is found wild in Egypt, Sennar, and Abyssinia, and forms an important article in the commerce of those countries. It is chiefly sent to Alexandria for shipment, whence it has gained the name of Alexandrian Senna among the drug-merchants. It is considered the most valuable of all the sennas. *Cassia lanceolata* is found wild in Arabia, whence it is exported under the name of Senna of Mecca. See SENNA.

Cassia bark and Cassia buds are the products of quite a different tree—namely, *Cinnamomum Cassia*—nearly allied to the camphor-tree and cinnamon-tree. [See CINNAMOMUM.] Cassia bark is thicker, coarser, and more pungent than cinnamon, and is at once known from it by a decoction being coloured blue by tincture of iodine. Its uses are the same as those of cinnamon, but it is somewhat more astringent. Cassia buds are, at least in part, gathered from the same tree. They are employed in the preparation of "pot pourri," and in confectionery.

CAS'SICUS is a genus of birds belonging to the section MAGNIROSTRES, of the order PASSERES, allied to the STARLING. They are distinguished, among other characters, by having the base of the bill produced upwards on the forehead in the form of a disc. The Crested Oriole (*Cassicus cristatus*) has its head adorned with a long-pointed crest of reddish feathers. It is about the size of a magpie, the greater part of the body being dark brown, the wings dark green, and the outer tail feathers bright yellow. The crested oriole is a native of South America. It constructs a pennisle nest composed of various vegetable fibres well interwoven, forming a large pouch measuring about 3 feet in length and 10 inches in diameter at its lowest part; the entrance is a small pocket-shaped hole near the top, and the bird always dives head foremost into its home; the bottom is furnished with a thick bed of dry leaves.

CAS'SIDA. See TORTOISE BEETLE.

CASSID'IDÆ. See HELMET BEETLE.

CASSINI, JOHN DOMINIC, a celebrated astronomer, was born at Perinaldo, in the district of Nice, 8th June, 1655.

He was educated at Genoa and Bologna, in the university of which place he succeeded to the chair of astronomy. He here observed the comet of 1652, on which he published his first work. He made various observations with a gnomon and meridian line constructed in a church at Bologna. He was at this part of his career patronized by Pope Alexander VII., and afterwards by Clement IX. In 1664-65 he made the first of his more brilliant and useful discoveries, namely, the time of the rotation of Jupiter. He also saw, for the first time, the shadows of the satellites on the disc. By comparison of his own observations with those of Galileo, he constructed (1665) his first tables of the satellites. In 1666-67 he found the rotation of Mars, and in this same year he ascertained that the rotation of Venus, which is difficult to observe on account of her phases, does not differ much from that of Mars. He made the apparent rotation of the sun to be about twenty-seven days, which is very near the truth. These results show great skill and assiduity, and made the name of Cassini well known throughout Europe.

When Colbert founded the Academy of Sciences, in 1666, and at the same time projected an observatory at Paris, he proposed to Cassini to remove into France, and offered him a pension equivalent to his Italian emoluments. Cassini expressed his willingness to comply if the consent of the pope (Clement IX.) could be obtained. This being done, he arrived at Paris 14th April, 1669, and began his duties at the observatory 14th September, 1671, where his observations extend from 1671 to 1683. In 1673 he was naturalized in his new country, and married a French lady. He never returned to Italy, except for a short time in 1695, but remained at the head of the Paris observatory. In the later years of his life he was totally blind. He died 14th September, 1712, without disease. In 1671-72 he discovered the third and fifth satellites of Saturn, and in 1684 the first and second. His gnomon at Bologna led him to more correct solar tables than had been in use, and to more exact values of the refraction. He gave a more complete explanation of the lunar libration than either Kepler or Hevelius, particularly in the determination of the quantities concerned; and though he did not have the actual observations, Delambre appears to think that he established by observation the coincidence of the nodes of the lunar equator and orbit. He was the first who carefully observed the zodiacal light, which had been discovered previously by Kepler. For his are of the meridian, his observations relative to refraction, with a multitude of other points too long to notice here, we must refer to Delambre ("Hist. d'Astron. Mod.," vol. iii.)

CASSINI, JAMES, son of the above, succeeded his father at the Paris observatory. He died 16th April, 1756, aged seventy-nine. His most important writings are "De la Grandeur et de la Figure de la Terre" (Paris, 1720), and "Elémens d'Astronomie" (Paris, 1740). He left also a great number of good observations.

CASSINI, CASAR FRANCIS, generally known as Cassini de Thury, son of the preceding, was born at Paris, 17th June, 1711. He succeeded his father as director of the observatory and as maître des comptes, and died 4th September, 1784, of small-pox. His most remarkable work was a large and accurate topographical map of France.

CASSINI, JOHN DOMINIC, son of Cassini de Thury, and most commonly known by his title of Count, was born at Paris, 30th June, 1718. He is the first of his family who decidedly adopted the system of Newton. He was elected member of the Academy in 1770, in which year he published the account of a voyage made by order of the king for trial of the chronometers of Le Roy. He was employed in 1787, with Meehan and Legendre, in the operations for the junction of the observatories of Paris and Greenwich by a chain of triangles. He made repeated endeavours to induce the government to re-establish the observatory upon a new footing and with large instruments.

The National Convention, apparently with the desire to force him to resign, resolved, in 1793, that the observatory should be placed no longer under the control of one person, but of four, who should take annual duty in rotation. Of the four the Count Cassini was one, and the other three were his own pupils. To this he refused to submit, and resigned his charge 6th September, 1793. He received an order to quit the observatory in twenty-four hours, and in the following year was imprisoned for seven months. From that time he abandoned astronomy entirely, and went to live in seclusion upon his own estate. He died on the 5th of October, 1845.

CASSIODORUS, MAGNUS AURELIUS, who lived in the sixth century, was a man of letters, an historian, and a statesman. Among other works he composed a history of the Goths in twelve books, which is only extant in the abridgment of Jordanis. Twelve books of his letters are extant, which extend from A.D. 509 to 539. Cassiodorus enjoyed a high reputation among his contemporaries for learning, eloquence, and talent; but his Latin is impure, and his style full of the conceits of the age.

He was born in South Italy, probably about A.D. 470. His father, also named Cassiodorus, was high in office under Odovacer and Theoderic; and he himself was early introduced to public life, and obtained the confidence of Theoderic, under whom he filled the offices of secretary and quaestor. By Theoderic's successors he was appointed master of the offices and praetorian prefect. He finally retired from the world, and founded the monastery at Viviers, in Calabria, where he lived in devotional retirement nearly to the age of 100. The best edition of his works is that of Garct, Rouen, 1679 (in two vols. folio), which was reprinted at Venice.

CASSIOPEIA. In the Greek fable Cassiopeia is the wife of Cepheus and mother of Andromeda, and was placed in the heavens with her head from the pole, so as to turn round apparently upside down, because she boasted of her daughter Andromeda's beauty as superior to that of the Nereids. This constellation may be found by looking on the side of the pole opposite to the Great Bear, where will be seen no small number of bright stars disposed in something like the form of an M or a W, as the case may be. The addition of a sixth (much dimmer) star gives "Cassiopeia's Chair," but the best vision of the chair is gained by considering its back as pointing towards the pole. See PLATE CONSTELLATIONS, Northern Hemisphere, close to the pole.

CASSITERIDES (the tin islands), the most ancient Greek name of BRITAIN. In later Greek times the term was limited to the Scilly Islands. They are first mentioned by Herodotus (iii. 115), who professes, however, his entire ignorance of them. Strabo (iii. 175, edit. Casaub.) describes them.

The Greek name of the metal tin, which is *kassiteros*, occurs in the Iliad of Homer, and the name of the islands is obviously derived from the name of the metal. *Kassiteros*, however, may not be a genuine Greek word.

CASSITERITE or TINSTONE (from Gr. *kassiteros*, tin, and *lithos*, stone), the chief ore of tin, and that from which almost all the tin of commerce is obtained. It is the oxide of tin (SnO_2), and crystallizes in the tetragonal system, usually as prisms capped by pyramids and often twinned, producing a characteristic ground form, indented at the projecting angles, as in the figure.

In colour it may be brown or black, with a high adamantine lustre; its hardness is from 6 to 7, and specific gravity from 6.4 to 7.1.

Until within comparatively recent years almost all the tin of commerce was obtained from Cornwall, where it is supposed to have been worked since the time of Herodotus

(450 B.C.)—Phoenicians, Jews, Greeks, and subsequently Romans visiting the country (Cornubia) for the metal.

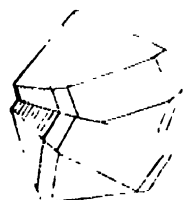
Formerly the tin was obtained principally from the old river gravels of the valleys, hence it was called stream tin; and many relics of the old workers are still to be found. Tin vessels and human bones, also bones of whales, and a deer's horn encrusted with tinstone, have been found, and are in the Cornwall Geological Society's museum. These superficial deposits are now nearly all exhausted, and the supplies are obtained from lodes, the prevailing direction of which is about east and west. In some of the districts they are followed to immense depths—the deepest mine in the country being 500 fathoms (over half a mile). The grains of tinstone are found dispersed through a hard rocky matrix. The ore is stamped fine, and then buddled repeatedly. When the stuff has been sufficiently concentrated it is calcined to drive off sulphur and arsenic from the pyrites, the calcined stuff is then subjected to a process of "buddling," "tossing," and "packing," till the percentage of ore is increased to about 60 per cent.; it is then packed in bags containing each about 5 cwt., and sent to the smelter. If the stuff contains wolfram it is necessary first to roast it with sulphate of soda and wash out the tungstate of soda. Metallic tin is obtained by calcining the ore with some carbonaceous substance (coke) in a reverberatory furnace, the crude metal thus obtained requiring to be subsequently purified.

CASSIUS, LONGINUS CAIUS, one of the chief conspirators in the murder of Caesar, was the quaestor of Crassus in the unfortunate campaign against the Parthians, B.C. 53, and he was one of the few who escaped into Syria. [See CRASSUS.] Succeeding to the command of that province, he held Antioch against the Parthians, and drove them for a time across the Euphrates. Upon the arrival of the proconsul Bibulus, B.C. 51, Cassius returned to Rome. He was tribune B.C. 49, and joined Pompey's party.

After the battle of Pharsalia, B.C. 48, he commanded a fleet in the Hellespont, which he surrendered to Caesar. He was one of the prime movers in the conspiracy against Caesar, B.C. 44; and he was chiefly instrumental in drawing M. Junius Brutus, whose half-sister he had married, into the plot. He had shared in Caesar's favours, having been nominated by him for a pretorship, and for the government of Syria. After the murder, Cassius, who had passed into Greece with Brutus, heard of the attempt of Mark Antony at Rome to transfer his province to Dolabella. He hastened into Asia and speedily collected forces, with which he mastered Syria, Phoenicia, and Judea; and he was on the point of invading Egypt when Brutus summoned him to return towards Europe to make head against the triumvirate. After plundering Rhodes (B.C. 42) he joined Brutus at Sardis, and the united army, marching through Thrace into Macedonia, encountered Antony and Octavian in the plain of Philippi. Cassius wished to avoid a battle as long as possible, being aware that the enemy must soon become straitened for provisions, but he yielded to the opinion of Brutus. In the first battle he commanded the left wing, and was opposed to Antony. Brutus was successful with the right wing, but pursuing his advantage too far he exposed the flank of Cassius, who was compelled to quit the field. He retired to a tent, where he was found dead. The story is that a freedman slew him by his own order.

Cassius was one of the best generals of the age, his temper was stern, and he professed a warm attachment to the republican cause. However, he has not escaped the imputation of being influenced by private enmity in his hostility to Caesar, and he was a vain, proud, and revengeful man. In his philosophical opinions he belonged to the Epicureans.

CASSIVELAUNUS (probably Caswallon), the brave British chief who withstood Caesar's invasion. See BRITAIN.



CAS'SOWARY (*Casuarus*) is a genus of birds belonging to the order STRUTHIONES. Of this genus nine species have now been described, all of which are confined to New Guinea and the adjacent islands. The cassowaries resemble the emus in having three toes on each foot, but are distinguished from them by the inequality of the claws, of which the inner one is much elongated, by the presence of five stiff cylindrical shafts destitute of barbs in each wing, by the position of the nostrils near the middle of the upper mandible, and by the possession of a large horny casque or helmet on the crown of the head.

The Common Cassowary (*Casuarus galeatus*) is found only in the island of Ceram. It is about 5 feet in height, and its body is clothed with a very long hair-like plumage of a black colour, through which the five bare quills of the wings project; its casque is black, and the naked wattled skin of the head and neck is bright red, tinged here and there with a somewhat livid azure blue. This bird feeds upon fruits, herbage, and seeds; and, like the ostrich, swallows indiscriminately almost anything that comes in its way. It runs very swiftly, and when in danger kicks very severely with its powerful feet. Its eggs are of a grayish-green colour.

The Australian Cassowary (*Casuarus australis*) is a native of North Australia. It is remarkable for its bright red, highly elevated casque. The Two wattled Cassowary (*Casuarus bicarunculatus*), an inhabitant of the Australian Islands, has the throat wattles separated and placed far apart on the sides of the neck. The One-wattled Cassowary (*Casuarus unguipedicularis*) is readily distinguished by the possession of a single small wattle on the middle of the throat. It is found in New Guinea.

The Mooruk (*Casuarus bennetti*) was described by Mr. Gould from specimens brought alive to Sydney from the island of New Britain, and afterwards presented by Dr. Bennett to the Zoological Gardens in London. It is a smaller bird than the common cassowary, measuring less than 4 feet in height to the crown of the head; the casque forms a sort of double crest at the back; a bare, brightly coloured space takes the place of the throat-wattle; and the wings contain only four spines. The mooruk runs very rapidly, and possesses an extraordinary power of leaping; it feeds principally on soft vegetable and animal matters, but, like the other birds of this family, will swallow almost anything. The natives of New Britain regard these birds as to a certain degree sacred, and treat them as pets, often carrying them about in their arms.

Four other species of this genus have been established with more or less certainty.

CASSYTHA is a genus of plants belonging to the order LAURINEÆ. They have the appearance of dodders, and frequently attach themselves parasitically to other plants. In Australia they are called scrub-vines, and sometimes grow so thick as to form an impenetrable barrier. Though in habit they are so unlike the laurels, in the structure of the flowers they are very closely allied. There are fifteen species, of which one is distributed through the tropics of both worlds, one or two are found in South Africa, one in Borneo, and the rest in Australia. The parts of the flowers are in threes; the three outer segments of the perianth are much smaller than the three inner. There are nine petal-like stamens, arranged in three whorls, and a fourth innermost whorl of barren stamens. The fruit is inclosed in the succulent tube of the perianth.

CASTAGNO, ANDREA DEL, a Florentine painter, was born at Castagno, near Florence, about 1409, and died aged about seventy-four. He was the first Florentine painter to adopt the new method of oil-painting, which he learned from Domenico Veneziano, and whom, after he had mastered the secret, he basely murdered. [See VENEZIANO, DOMENICO.] Very few of Castagno's works now remain. In 1478 the Pazzi, and other conspirators concerned in the

murder of Giuliano de' Medici, were all painted by Castagno, hanging by the feet, on the façade of the palace of the Podesta. It was his best work, but it has long since perished. (Vasari, "Vite de' Pittori," &c.; Baldinucci, "Notizie dei Professori del Disegno," &c.)

CAS'TANET or **CAS'TAGNET** (Spanish *castanola*, che-tnut) is a Spanish instrument for accompanying dances with sharp cracking noises. A pair of castanets consists of two pieces of ebony or boxwood, probably originally chestnut, each hollowed out into a cup shape and hinged together very loosely by a cord, long enough to pass round the fingers. A quick clenching of the fist brings the two halves together with a sharp crack, and as a pair is used in each hand, rhythms of every kind can be expressed, from simple detached accents to the most rapid succession, like the quick roll of a side drum. Children and unskilled performers use castanets mounted on a handle, which when shaken will serve to mark the rhythmic effects. The effect of the bolero danced to the music of guitars, and marked by the castanets in the hands of the dancer herself, is most exciting and vivid.

CASTANOSPERMUM, a remarkable genus of Liliaceæ, containing only one species. This tree, *Castanospermum australe*, grows from 30 to 40 feet high in the forests near Moreton Bay in Australia. The shade afforded by the foliage is said to excel that of most Australian trees. By the natives the seeds are eaten on all occasions; when roasted they have the flavour of a Spanish chestnut, but are hard, astringent, and not at all better than acorns.

CASTE (Portuguese *casta*, a breed), the term most generally used to describe the different classes of Hindu society, but employed also not infrequently in reference to class distinctions in other countries than India. Palfgrave maintains that the colleges of operatives, which inscriptions prove to have existed in Britain during the Roman period, were practically castes, because by the Theodosian code the son was compelled to follow the father's employment, and marriage into a family involved adoption of the family employment. Similarly, in many countries political considerations or distinctions of race have prevented intermarriage between classes; as, for instance, in the case of the patricians and plebeians of Rome. In some civilized countries at the present day social custom is as strong as any caste laws could possibly be in preventing intermarriage between particular classes. In Madagascar marriage is strictly forbidden by law between the four classes of Nobles, Hovas, Zarahovas, and Andeves, the lowest of whom are little better than slaves. All nations have at one time opposed themselves to marriage with foreigners, known chiefly as enemies; and all nations have opposed, industrially and politically, the races they have conquered. In one sense slavery might be called the lowest of castes, and in another sense the marriage of a squire's daughter with one of his subjects might be described as an infraction of caste rule.

But there is still a very great difference between the unwritten law of social custom, however stringent, and caste as it has existed in India during no less than 3,000 years. The entire religious and social system of the Hindus is based on this institution, which was originally introduced to uphold the political supremacy of the fair Aryan intruders over the dark aborigines. Prior to its introduction, about 1200 years before the Christian era, a considerable intermixture had already taken place, except, perhaps, amongst the very highest classes of the Aryan conquerors. The indigenous elements being by far the most numerous, the Aryans were thus threatened with ultimate absorption, and in fact had in many places been largely assimilated with the natives. They could be saved from extinction only by checking further alliances. Marriage with the dark races was accordingly forbidden, and a definite rank assigned to each shade of colour (the

Hindu word corresponding to castes is *varnas*, or colours), which had already been developed, while the prohibition itself was referred by the Vedas to Divine prescription. In the laws of Manu, the Ramayana, the Mahabharata, and other Sanskrit works of antiquity, we find the system of castes fully developed.

All the Hindu writings recognize only four pure castes—*Brahmans* (priestly order), *Kshatriyas* (warriors), *Vaisyas* (citizens, traders, agriculturists), and *Sudras* (the menial classes). Pliny appears to have heard of the same number; but Megasthenes, from whom Arrian, Strabo, and Diodorus Siculus derive their account, mentions seven classes:—1, Philosophers; 2, agriculturists; 3, herdsmen and hunters; 4, handicraftsmen and artisans; 5, warriors; 6, public inspectors; 7, royal councillors. But Megasthenes has evidently separated into distinct classes individuals belonging to the same class: the public inspectors and royal councillors, as well as the philosophers, belonged without doubt to the Brahminical class; the agriculturists, herdsmen, and hunters, to the Vaisyas; and the handicraftsmen and artisans, to the Sudras.

The following extract from the "Jatimala," a Sanskrit work on Hindu castes, gives the common Hindu tradition respecting the origin of each caste. "In the first creation by Brahma, Brahmanis preceded, with the Veda, from the mouth of Brahma; from his arms Kshatriyas sprang; from his thigh Vaisyas, from his foot Sudras, were produced; all with their females. The Lord of Creation, viewing them, said, 'What shall be your occupations?' They replied, 'We are not our own masters; O God, command us what to undertake.' Viewing and computing their labours, he made the first tribe superior over the rest. As the first had great inclination for the divine sciences (*Brahme vidya*), therefore he was Brahmana. The protector from ill (*Kshayate*) was Kshatriya. Him whose profession (*Vasa*) consists in commerce, which promotes the success of wars for the success of himself and mankind, and in husbandry and attendance on cattle, he called Vaisya. The other should voluntarily serve the three tribes, and therefore he became a Sudra; he should humble himself at their feet."

A strong line of demarcation is drawn between the first three castes and the Sudras. The former are allowed to receive instruction from the Vedas, and are considered to have been born again in a spiritual sense, whence they are called regenerate. A Sudra, on the contrary, is not reckoned among the regenerate, and would, according to ancient Hindu law, be put to death for reading the Vedas.

Beyond the Sudras were the *Pariahs*, or *outcastes*, a term which originally simply meant "hillmen," and which is thus considered to throw much light on the institution. It is held to show that, while the three highest orders were reserved for the ruling Aryans, the Sudra mainly comprised the aborigines who had been reduced to a state of the lowest of Helotism; whereas the Pariah embraced the independent hillmen, who were excluded from all the social privileges of the Hindu system. Refusing to submit to the conquering race, and successfully maintaining their independence in the inaccessible mountain fastnesses of the Vindhyas, the Satpuras, and the Ghats, both Eastern and Western, where so many of them are still found, they were denominated *hillmen*, and the term Pariah, or highlander, came to be synonymous with outcaste. Hence, the outcaste, in its proper extent at least, be regarded as the last remnant of the original elements, and the surviving representative of a pure Aryan or prehistoric culture. The laws of Manu included with in the term *Chandalas* not only all the Pariahs, but those who violated the laws of their particular caste. And according to Manu the Chandalas must not dwell within town; his sole wealth must be dogs and asses; his clothes must consist of the mantles of deceased persons; his dishes must be broken pots!

The system must have been profoundly modified by the advent of Sakyanmuni, for the Buddhist teaching is—"As the four rivers which fall into the Ganges lose their names as soon as they mingle their waters with the holy river, so all who believe in Buddha cease to be Brahmans, Kshatriyas, Vaisyas, and Sudras." After Buddha, Sudra dynasties ruled in many parts of India, and under the Mogul dynasty the Cayets, who were a race of Sudras, had almost a monopoly of public offices. In the Buddhist world all classes, however low their degree, are eligible to the priesthood, which commands the homage of the highest. Buddha teaches that—

"A man does not become low caste by birth,
Nor by birth does one become high caste;
High caste is the result of high actions—
And by actions does a man degrade himself to caste
that is low."

In Ceylon, however, where Buddhism survives in its purest and most primitive form, caste distinction is rigidly maintained as a conventional and social, though not as a sacred institution. The highest caste among the Singhalese is the *Goi-vansa*, or tillers of the soil; there are, besides, fishers, smiths, washers, baggage-carriers, weavers, potters, scavengers, and many others. Every trade is a caste. The castes do not intermarry, and neither wealth nor European influence has had any effect in breaking down caste distinctions. A few years since the wealthiest native of Ceylon was a fisher by caste, but his wealth could not gain him admittance to the houses of the native aristocracy, who are all of necessity of the highest caste.

In India itself, Hinduism, as a religious system, has always met with the utmost possible toleration both from the Moslem and Christian governments. Hence, the Brahminical or sacerdotal caste has survived all the political changes by which the land has been convulsed during the past 1200 years; and, speaking generally, the Brahmans throughout the peninsula are to this day conspicuous for their intelligence, retaining much of the common Aryan inheritance, and displaying the noble cast of countenance which is characteristic of that race. The other castes exist, but far less distinctively. The religious system of the Prophet is entirely opposed to caste, and under the supremacy in turn of the Mohammedan and Christian, the Hindu warrior caste has gradually disappeared. The Vaisyas and the Sudras remain, but levelling influences have done much to remove the disabilities entailed by the code of Manu. Every profession, with few exceptions, is open to every description of persons, and both Brahmans and Sudras enter into all trades. Brahmans have succeeded in maintaining a monopoly of Vedic learning, and in excluding others from sacred employment; but only a limited portion are engaged in religious ceremonies, in sacred study, or even in religious begging. Many are privates in the army, many water-carriers, many domestic servants; while there is no legal ban against men of the lower castes rising to positions of honour and distinction. Entire redemption from the social yoke will ultimately be found in the spread of education, in such internal upheavals as are foreshadowed by the BRAHMO SOMAJ and other monotheistic movements, and in the silent influences of the higher European culture, quickened by the development of the railway system and other levelling influences.

CASTEL, CASTEL'LO, a component part of the names of many French, Italian, and Spanish towns. It is derived from the Latin *castellum*, which originally meant a *fort* or *castle*, but came afterwards to be applied to the village or collection of houses that rose in course of time round the fort.

CASTEL' LAMA'RE or **CASTEL'-A-MA'RE**, a city and seaport of Southern Italy, on the Gulf of Naples, 15 miles west of Salerno, on a branch line of the railway from Naples to Salerno. Population, 33,102. It is the seat

of a bishopric, and is well built, partly along the shore, but principally on the side of the mountain rising immediately from it. It has a royal palace, a cathedral, several churches, and convents, one of which possesses an image of the Madonna, found in a well in the eleventh century, and an object of great veneration among the peasantry, a military hospital, fine barracks, a royal dockyard, and hot baths. There are manufactures of linen, silk, and cotton, with tanneries. As a shipbuilding place it ranks second in Italy. The port, which is small, is defended by two forts. Being exposed to the north and elevated, Castellamare has acquired great celebrity as a summer residence, in

consequence of its coolness, the salubrity of its air, and the beauty of its environs. But in autumn it becomes damp, chill, and disagreeable. The royal Casino of Quisisana stands on the site of a house erected by Charles II. of Anjou about 1300. It received its present name (meaning "one recovers health here") from Ferdinand I., who restored the building in 1820. The ruins of the castle, whence the town derives its name, are on a hill south of the town. It was built in the thirteenth century.

Castellamare is built on the site of the ancient *Stabia*, which, having been destroyed by Sulla during the civil wars, was afterwards principally occupied by villas and



CASTELLAMARE.

pleasure-grounds. It was here, A.D. 79, that the elder Pliny, wishing to approach as near as possible to Vesuvius during the dreadful eruption that overwhelmed Herculaneum and Pompeii, fell a victim to his curiosity and thirst for knowledge.

CASTELNAUDARY, a town in the department of Aude, France, situated on an eminence above the Canal du Midi and the Fresquel, and 21 miles west of Carcassonne; population, 8919. The town is ill built; the only edifices worth mention are the Church of St. Michel, the court-houses, the communal college, and the hospital, which is richly endowed. To the south of the town is a reservoir of the canal, which is 1312 yards in circuit; it is bordered with docks, and surrounded by shops and stores, and gives the town the appearance of a port. There are an exchange and a polytechnic society in the town. Coarse cloths, canal boats, pottery, and bijoux are made; there are also brandy distilleries and flour-mills. Besides the articles named, the town trades in timber, iron, and hides.

Castelnaudary has been supposed to be the ancient *Nostomagus*, and to have derived its present name from the words *Castrum nostrum Ariatorum*, referring to its having been rebuilt by the Visigoths, who belonged to the Arian party. It suffered terribly in the crusade against the Albigenses. In 1212 the Counts of Toulouse and Foix were signally defeated here by Simon de Montfort, and in 1355 it was captured by the Black Prince. In 1632, in an encounter under the walls of the town, the Duc de Montmorenci, commanding the troops of Gaston, duc d'Orleans, was wounded and made prisoner. Being taken to Toulouse, he was convicted of treason and executed.

CASTILE (in Spanish *Castilla*) is the name of one of the early kingdoms formed by the Christians in the central districts of the Spanish peninsula, during the period of the occupation of Spain by the Moors. It was first separated into an independent country in 732, but it then comprised only a portion of the territory afterwards embraced under the name. In the tenth century Burgos was its capital. After the expulsion of the Saracens the sovereignty came

by marriage to Sancho III., king of Navarre, whose son Ferdinand was made king of Castile in 1034. He married the sister of Veremond III., king of Leon, but afterwards killed his father-in-law in battle, and was himself crowned king of Leon, in 1037. The crowns of Castile and Leon were afterwards separated and again united several times, till, by the marriage of Isabella, who held both crowns, with Ferdinand, king of Aragon, in 1479, the three kingdoms were consolidated into one. Castile then embraced almost the whole of the territory now included in modern Spain, and Spaniards are not infrequently to this day called Castilians. The name Castile is said to have its origin in the number of castles (Spanish *castillos*) built by the Christians, who had taken refuge from the Moors in the Asturias, as a defence against these enemies. Until the year 1833 Castile formed two of the divisions of Spain, under the names of Old and New Castile. **OLD CASTILE**, or *Castilla-la-Vieja*, is the portion first acquired from the Moors, and is now represented by the provinces of Burgos, Logrono, Santander, Soria, Segovia, Avila, Palencia, and Valladolid. **NEW CASTILE**, or *Castilla-la-Nueva*, occupied the south part of the great central plateau of Spain, and the modern provinces of Madrid, Toledo, Guadalajara, and Cuenca now cover its area. Castilian is the standard dialect of the Spanish language. During the struggles with the Moors many dialects of the *Romance*, or mixture of the Latin with the Germanic tongues, grew up in Spain, which finally melted into three—the Galician, Castilian, and Catalan. On the marriage of Isabella, queen of Castile, with Ferdinand of Aragon, the Castilian *Romance* became the language of the court, and has maintained its pre-eminence ever since. The inhabitants of the Castiles have at all times been distinguished for their lofty pride and the haughtiness of their demeanour, but they have at the same time earned a character for truth and bravery. This region anciently formed part of *Cantabria*, and the country of the *Celtiberi*, *Ortani*, and *Carpentani*.

CASTILLON, a town of France, in the department of the Gironde, situated on the right bank of the Dordogne,

25 miles E. from Bordeaux; population, 3064. There are cotton-factories and rope-yards, and nails are manufactured to a considerable extent. There is also some trade in wine. Near the town are the remains of an old castle, near which, in 1153, the English were defeated, and Lord Talbot and his son slain. It is to this battle that Shakspeare refers in the play of "King Henry VI.," part i. In the commune of Castillon are the remains of the Château de Montaigne, to which the illustrious essayist of that name retired in 1572, and where he breathed his last on the 13th of September, 1592.

CAS'TLE (from the Latin *castellum*, a diminutive of *castrum*, an encampment) is a walled inclosure with a tower or towers, strongly constructed, and intended as a place of safety. Numerous castles, many of which are in ruins, still remain in various parts of Great Britain, France, Germany, Italy, and in the East. The castles of England consist of those erected by the Romans; of British and Saxon castles erected previous to the Norman Conquest, and Norman castles erected after it; and also of the more modern stone and brick castles, erected from about the reign of Edward I. to the time of Henry VII. The Roman castles in this country are numerous, and some of them still in very perfect condition, such as Barch Castle and Richborough Castle. The Saxons most probably adapted the Roman enclosures to their modes of defence, and it appears that they often raised a mound on one side of the walls, on which they erected a keep or citadel.

In various parts of England, Scotland, Ireland, and Wales there are numerous encampments or castles, mostly occupying the summits of hills, which have been ascribed to the aboriginal inhabitants. Among the most remarkable are the Herfordshire Beacon, on the Malvern Hills, in Worcestershire; the Carr-Caradoc, near Clough Strutton, in Shropshire; Moll Artan, in Flintshire; Clun Castle, in Shropshire; and Maiden Castle, in Dorsetshire.

Roman *castra* were probably sometimes formed on the tops of British works. Richborough Castle, in Kent, perhaps the earliest Roman castle constructed in this island, has been conjectured to have been formed in the reign of Claudius, and completed by Severus (Battley's "Antiq. Rutupne," pp. 6, 11, &c.). It still retains the leading features of one of the most perfect of the stationary castles built by the Romans in England. In the walls are the traces of the four gates, and the towers of brick, or Roman tiles, occur with great regularity amongst the rubble.

Saxon castle-building was probably borrowed from the Romanized Britons, who had acquired a taste and knowledge of the arts from the Romans. Thus in Devonshire there are works that have an appearance of Roman character and design, and yet are so much ruder in execution than any other Roman works that they can only be referred to a time when the knowledge of the Roman arts, though yet fresh in the memory of the inhabitants, might probably have declined.

Norman castles, as fortifications, are the strongest. They consisted of mounds and ditches, or moats, with towers on the mounds surmounted with battlements; the towers were fortified at the top with small projecting towers, called turrets. In the walls were entrance-gate towers, with bridges either of stone or wood, which were raised to come up and down. The entrances were also guarded with thick doors and portulises, or gates, which dropped down through grooves at the side of the masonry. All apertures, except the gateway, were usually very small. Platforms were built behind the parapets. The gateway was sometimes defended by a barbican, and also flanked by towers, as well as the outer walls. The keep was usually in or near the centre of the castle, and it had sometimes a chapel within it. Rochester Castle, which stands on a small eminence near the bridge over the Medway, is a fine example of a Norman castle.

According to Asser's statement, Alfred built castles of wood and stone. Elfrida, his daughter, built eight castles in three years (Henry of Huntingdon's "History," p. 204). William of Malmesbury describes a stone castle built by Athelstan at Exeter, A.D. 944. William the Conqueror was a great builder of castles. Forty-nine castles are mentioned in Domesday Book, which notices Arundel as the only one named in the time of the Conqueror. It is said that at the end of Stephen's reign no less than 1115 castles existed in England. At a later period, when civilization had advanced and the country had become more settled, castellated mansions, which combined some of the features of a castle with a greater regard to comfort and elegance, were erected. Fine examples of such buildings may still be seen at Caistor (Norfolk) and Hurstmonceux (Sussex), and at Haddon Hall (Derbyshire). It is almost unnecessary to remark that the building of such strong edifices, which in the then state of warfare were often impregnable, is a proof of the insecurity of life and property which prevailed. Every feudal chieftain had his stronghold, round which his immediate retainers rallied, for the purpose of mutual defence or to annoy and plunder their neighbours. A very considerable number of old towns of Europe gradually arose around these baronial fortifications; and it is interesting to trace, in the history of many of these communities, the progress by which the town, originally a miserable dependence on the castle, gradually obtained privileges, and charters, and wealth, and increased in strength and importance exactly in proportion as the owner of the fortress lost both, till finally the castle, from being neglected and deserted, was either levelled with the ground and furnished materials for house-building, or remained in ruins, an enduring monument of the slow but certain victory of the town.

CASTLE CARY or **CASTLE CAREY**, a market-town of Somerset, 121 miles from London. The principal street extends nearly a mile on the road to Ilchester. The houses are straggling, but neatly built. The trade of the town is inconsiderable, consisting almost wholly of weaving hair for the seats of chairs. The church is picturesquely situated; it is a decorated building of the time of Henry VI., with a fine old font and richly carved pulpit, and a new tower and spire; it underwent thorough restoration in 1867. The town-hall and market-house, an ornamental building, was built in the same year. The castle is now little more than a name, represented only by a few mounds and earth-works. It has never been of importance since the days of Stephen, when it was held for Mand by its Loyal lord, and taken by Stephen in person, after a siege in which he threw, "by his machines, showers of missiles and fire without intermission among the garrison, reducing them to starvation." This was one of the places that gave a night's shelter to the second Charles in his flight from Worcester. In the neighbourhood rises the remarkable oolitic height of Cadbury, crowned by a strong and spacious camp of great antiquity, which is encircled by four deep ditches, and as many massive ramparts of earth and stone. In the centre rises a mound, or *protorium*, called King Arthur's Palace. Population, 2034.

CASTLE CONNELL or **STRADBALLY**, a town in the province of Munster, county of Limerick, 6½ miles N.N.E. of the city of Limerick. This town is chiefly interesting for the ruins of its old castle, which stand on a high rock above the river Shannon. It was here that the Prince of Thomond, having secured Brian Boroinne, who was his host, in an ambush, put out his eyes, and had him murdered. In the vicinity is a chalybeate spring, situated in the midst of most beautiful scenery. There are also, at a short distance, the falls or rapids of Doonass, where the Shannon rushes, for more than half a mile, with a depth of 40 feet and a width of 300 yards, amidst masses of huge rock, its bed having a considerable decline.

CASTLEBAR' or **AGLISH**, the county town of Mayo, Ireland, and a station on the Midland Great Western Railway, 15 miles from Clare and 159 miles W.N.W. of Dublin, is situated near the bottom or north-east end of the Castlebar Lake, and is watered by the Castlebar River, which flows N.E. and N. to Lough Callin and Lough Conn. The streets are tolerably regular, and in the square are the county courts, public offices, and a promenade. The town contains also a Protestant Episcopal church, spacious Roman Catholic chapel, Methodist meeting-house, castle, infantry barracks, linen hall, work-house, and prison. Castlebar has a good retail trade, and much corn and agricultural produce; a considerable quantity of coarse linens are disposed of at the weekly markets. It was formerly a parliamentary and municipal borough. Its lighting, paving, &c., are now regulated by twelve town commissioners. Population, 3855. Castlebar Castle was held by Sir Henry Bingham for the Parliament in 1641, but he was obliged to surrender, and the whole garrison were treacherously massacred. Lord Mayo, who commanded the king's troops, was executed for this crime in 1653. The notorious "fighting Fitzgerald" was executed here in 1786. The town was taken by a French force under General Humbert, which landed at Killala in 1798, but was shortly after evacuated, on the approach of the main army of the British under Lord Cornwallis. "Castlebar races" is a name given to this incident.

CASTLECC MER, an inland town of Ireland, province of Leinster, county of Kilkenny, on the Been, an affluent of the Nore, 52 miles S.E. of Dublin. The town, which suffered much in an unsuccessful attack by the insurgents in 1798, consists of a main street planted with trees on each side, and of some others branching from it, and is remarkable for neatness and good order. The parish church, on a neighbouring hill, a large Catholic chapel, a convent, a Methodist meeting-house, a court-house, a dispensary, and a barracks are the principal buildings. Little trade is carried on, the place deriving its support chiefly from the neighbouring collieries, which furnish a copious supply of fuel to the adjoining counties. The mineral is of the carbonaceous or stone coal species, which burns without flame, being the slaty glauca coal of Werner. Population, 7181.

CAS'TLEMAINE, a town in the county of Talbot, Victoria, Australia, situated at the junction of Barker's and Forest creeks, 77½ miles N.N.W. of Melbourne, and a principal station on the railway from Melbourne to Echuca. It is also connected with a branch line to Maryborough, and by that route with Ballarat and the western districts. The town, which is under municipal government, and has an area of 5760 acres, is pleasantly situated, the streets are well laid out and planted with trees, and the buildings, both public and private, are such as befit a town of considerable magnitude. Height above sea level, 919 feet. The most notable of the public edifices are the benevolent asylum; public offices containing the post, savings bank, and telegraph, land and survey, water supply, and treasury departments; the hospital, the supreme court, the mechanics' institute, and the churches; there are several schools, and a theatre. The town is lighted with gas, and supplied with water from the Malmesbury and Expedition Pass reservoirs. The diggings in the neighbourhood were once very numerous, and were among the first discovered in Australia. The extent of auriferous ground is estimated at 164 square miles, with 405 auriferous quartz reefs. In the division are 9½ square miles and 103 reefs. The quarrying of slate is also largely carried on in the district. The vine is cultivated to a considerable extent in the neighbourhood, but it is on the mining capabilities and agricultural resources of the district that the prosperity of the town depends. Copper, galena, iron, and other minerals have been found, but it is doubtful whether they would pay for working. Population, 6000.

CAS'TLEREAGH, LORD. See **LESDONDERRY, MARQUIS OF.**

CASTLE-RISING, a small town in the county of Norfolk, 4 miles N.N.E. of Lynn, and about 100 from London. It is chiefly famous for the ruins of its castle, in which Isabella, the widow of Edward II., was confined.

CAS'TLETON, a town in the county of Lancaster, a mile S.S.E. of Rochdale, within which borough it is chiefly included, and 200 miles from London, Rochdale being its station. It has manufactures of cotton and woollen goods. There are a lofty mound and a fosse here, the remains of what must be a very ancient castle, as its foundation is not mentioned in Domesday Book. A traditionary story narrates that a number of Danish invaders were killed here, and that the name Killdanes, given to a part of the valley, is derived from this incident. Population, 35,272.

CAS'TLETOWN (in Manx, *Bully Cashell*) is situated in the south of the Isle of Man. It is regarded as the metropolis, because the chief courts are held there, and the lieutenant governor's residence was formerly in the neighbourhood, but he now resides at Douglas. The town is built round the old castle of Rushen, one of the finest and best preserved specimens of Danish architecture in the kingdom. It is said to have been built in the year 960 by Godred, the first son of King Orty. It is now used as the insular gaol. In the neighbourhood are the House of Keys, where the Manx legislature meets, and King William's College. A small shipping trade is carried on, and there are some breweries and corn-mills. Population, 3000.

CAS'TOR and **POL'LUX**, or more properly **CASTOR** and **POLADICTES** the twin Dioscuri, that is, "sons of Zeus" were, according to Homer, sons of Leda and Tyndareus, and brothers therefore of Helen, cause of the war of Troy. Homer often calls them the Tyndarids. Castor was the great horse-tamer, amongst the mythical heroes, and Pollux was the most skilful of boxers. Their first exploit was the rescue of their sister Helen from Theseus, prince of Athens, who had carried her off. They also took part in the voyage of the Argonauts, and Pollux conquered the famously Amycus, king of the Bebryces, and son of Poseidon, in a boxing match, and killed him indeed. Other poets say that it was Pollux who perished, and that the Argonauts took a bloody revenge on the Bebryces and their king. Their most famous myth, however, is the memorable cattle raid which they undertook with Idas and Lynceus, when Idas claimed the whole booty. Castor fell in the combat that ensued, and Pollux prayed to die with him; a prayer granted by Zeus in the form of their alternate life-day by day. It is thus that they appear in Homer. Zeus placed them among the stars as the constellation Gemini, a fate foretold by the appearance of a star upon their forehead in a storm which overtook the Argonauts. The Dioscuri were especially the protectors of men in distress. Riding on their great white horses, they helped the Romans to win the battle of Lake Regillus over the Latins, and brought the news of the victory to Rome as they slayed their horses' thirst at a fountain at the Forum. To commemorate this visit a splendid temple, some columns of which still remain, was erected to them by the dictator Postumius Albinus, and was honoured by a yearly procession of the whole equestrian or knightly order.

The constellation Gemini, or the Twins, is well-known by the two lovely stars Castor and Pollux. (See **PLATE CONSTELLATIONS**, Northern Hemisphere, above the number VII.) The second is the eighteenth brightest star in the heavens, being now resolved into a close cluster of four, however; the first is not so brilliant, but is more interesting, as being the finest double star in the heavens. Castor is nearer to the pole-star than Pollux. The sign Gemini now coincides with the constellation Taurus, its symbol being shown on the bull's shoulder; it indicates the part

of the zodiac between the 60th and the 90th degrees, and the precession of the equinoxes has shifted the zodiac forward by one constellation's distance. The sun enters the sign Gemini about the 21st of May in each year, and leaves it about the 20th of June.

CASTOREUM or **CASTOR**, a secretion found in two pear-shaped membranous sacs situated in a cavity at the posterior part of the trunk of the beaver. These are connected with, but are quite distinct from, the organs of reproduction, and are found both in the male and female animal. The secretion is at first a liquid of the consistence of syrup, but it ultimately becomes solid, losing some of its odour and activity. As met with in commerce it is of two kinds, the Russian and Canadian, the former being the more valuable of the two. The odour is peculiar, very penetrating, and powerful. It has been used in medicine from the time of Hippocrates and it was formerly supposed to be a useful remedy in cases of hysteria, hypochondriasis, nervous palpitation of the heart, and colic, while it was considered to exercise a special influence over the uterus. These virtues appear to have existed more in imagination than in reality, and this substance is now employed very little in medicine, but is chiefly utilized by perfumers.

CAS TOR-OIL is a product of *Rhizus communis*, a plant which was introduced from very ancient times both to the Egyptians and the Greeks. The native country of the *Rhizus communis* is considered by De Candolle to be tropical Africa. Like all plants which have been long in cultivation, numerous varieties of it are met with, differing not only in colour and the peculiar pruriose condition of the stem, but in stature and duration. In warm countries it is liguaceous and perennial, in cold, annual and herbaceous. The entire plant is possessed of active properties, but only the oil extracted from the seeds is employed in Europe. The ancients administered the seeds entire, but their variable action, occasionally even producing fatal effects, led to their disuse, and the oil is of comparatively recent introduction. The seeds, of which three are found in each capsule, are about the size of a small bean. They were formerly known in the shops as *Semina ricini*.

Castor-oil of good quality is a thickish fluid, of a very pale yellow colour, almost limpid, with a slightly nauseous odour and an oily taste, mild at first, but causing a feeling in the back of the throat which is more or less intense in proportion to the freshness of the specimen. Old or badly-prepared oil is rancid and disagreeable.

The best castor-oil (known as "field drawn") is prepared by pressing the shell and encased seeds in hemp bags in an hydraulic press, and heating the oil thus obtained with water in well-tinned vessels until the water boils, and the albumen and gum separate as a scum; this is carefully removed, and the oil as soon as it has become clear is filtered through flannel and put into cisterns. This is the process adopted in Calcutta for the East Indian castor-oil, which is by far the most abundant in our home market. In England castor-oil is expressed by Bramah's hydraulic press, or by the common screw press, in a room artificially heated. It is purified by rest, decantation, and filtered and bleached by exposure to light on the tops of wooden cases. For other processes, including those used in America and on the Continent, consult "Chemistry, Theoretical, Practical, and Analytical, as applied to the Arts and Manufactures" (MacKenzie, Lond. 1883).

Castor-oil can be solidified only at a very low temperature. It is dissolved among fixed oils by its complete or nearly complete solubility in pure sulphuric ether and in alcohol, thereby approaching the essential oils in its habitudes, and its easy combination with the alkaline lyes, and consequently its ready saponification, two properties of much importance, the one furnishing a convenient test of its purity, the other facilitating its administration in a form less repulsive than its ordinary state.

Castor-oil is a mild aperient or laxative when pure, operating without griping or other inconvenience, and commonly very soon after its administration. It is the most proper laxative for infants, and in many inflammatory states of the abdomen, or of the kidneys, bladder, &c. It is also one of the best purgatives in rheumatism, especially in lumbago, and one of the best means of relieving habitual constipation, as, unlike other purgatives, the dose may be successively reduced without its power being impaired. It is also a most eligible medicine in piles or other affections of the rectum. Alone or with turpentine it is a very efficacious means of expelling worms. The chief obstacle to its extensive use is the repulsive taste which it often possesses. Many expedients have been adopted to remove or lessen this, but no artifice can make bad or old oil good or palatable. It is usually floated on peppermint water or on distilled water, with syrup of lemon or orange, to disguise its nauseous taste. By far the best plan, however, is to take advantage of its tendency to combine with alkalies, and so form a soapy emulsion, which does not destroy the purgative power, while it completely alters the appearance, and prevents any one recognizing the oily object of his aversion. To effect this, however, requires care and skill, especially as a variable quantity of alkaline lye is needed, according to the age of the oil. In general from fifteen to twenty drops of pure liquor potassæ will saponify half an ounce of oil, to which one ounce of distilled water and one drachm of spirit of pimento or of nutmeg should be added. Nearly the whole of the castor-oil imported into the United Kingdom is received from Bengal.

The castor-oil plant belongs to the order EUPHORBACEÆ. In tropical countries it is 40 feet high; in this country it does not grow more than 4 or 5 feet high. The leaves are large and petiolate, the blade 6 to 8 inches across, divided palmately into eight or ten lanceolate segments. The flowers are monocious, the stamens branched and very numerous. The seeds have a caruncle at one end.

CASTRES, a town in the department of Tarn, in France, stands on the Agout, a feeder of the Tarn, at a distance of 46 miles E. from Toulouse, and had 23,794 inhabitants in 1882. The S.E. part of the town, called Villagoudon, is joined to Castres properly so called by two stone bridges. The streets are pretty well built, and have been much improved of late years. The most important public buildings are—the town-house, formerly the episcopal palace, to which is attached the public library and a beautiful garden; the churches of St. Benoit and Notre Dame, the two hospitals, the cavalry barracks, the abattoir, and the theatre. Tribunals of first instance and of commerce are held in the town, which has also a chamber of commerce, a college, two theological seminaries, and a Calvinistic church. In both parts of the town there are beautiful shady promenades, called *lées*; and in the neighbourhood there is an immense rocking-stone on the top of a hill, at the foot of which is a grotto that was once the retreat of St. Dominic.

Castres is a place of great manufacturing industry; from their care and skill, and the finish given to their productions, its artisans are considered the best in the south of France. It is particularly celebrated for its fine wool-dyed cloths, called *cuits de laine*; but all other sorts of woollen stuffs are manufactured, as well as linen, soap, leather, glue, and paper. There are also several bleaching, dyeing, and silk-weaving establishments, and iron and copper foundries. Coal, iron, lead, and copper are found in the neighbourhood, and the manufactures are thriving and important. Castres espoused, in the sixteenth century, the Protestant party, and Henry IV. resided in it for a lengthened period. Its ramparts were demolished by Louis XIII., and the bishopric was suppressed at the Revolution. It is the birthplace of Dacier, the critic; of Rapin, the historian

of England; and of the Abbé Sabatier. The town is the seat of a Protestant consistory, and was founded in 647, near a Roman encampment. The commerce of the town is very considerable.

CASTRO, FRANCIS ALPHONSO A., the Franciscan confessor of Philip II. (1495-1558), was the real head of the persecutions under Queen Mary. He was a native of Zamora, and came with his master to England. He preached against the Marian terror, which, nevertheless, Mr. Blunt shows clearly he himself organized ("Reformation of the Church of England," Lond. 1882). His reward was the archbishopric of Compostella, but he died at Brussels before he had received the papal confirmation. His "Treatise against Heresies" (1534) gained him Philip's favour.

CASTRO GIOVANNI, a town of Sicily, in the province of Caltanissetta, is on a central table-land, 4000 feet above the sea, and 13 miles N.E. of Caltanissetta. It is healthy, and well supplied with water. The population is about 12,000. This town is near the site of the ancient *Enna*, which was celebrated in antiquity as the birthplace of Ceres, and the site of her most sacred temple. It is now one of the poorest towns in the island. It still, however, commands an extensive and delightful prospect, and has a clear salubrious atmosphere. The surrounding country, which is very fertile, was, in antiquity, ornamented with innumerable groves and temples, appropriated to the worship of Ceres and Proserpine. Livy has correctly described the city as built in *excelso loco ac prærupto*; and Cicero has given an eloquent description of the town, temple, and statue of Ceres, carried off by the wholesale plunderer Verres: "*Simulacrum Cereis Ennæ ex sua sede ac domo sustulit, quod erat tale, ut homines, quum viderent, aut ipsam videre se Cereem, aut effigiem Cereis, non humanâ manu factam, sed cælo delapsam, arbitrantur.*" But all traces of the temple, as well as of the worship of the goddess, have disappeared. The castle, on the summit of the hill, was built by Frederick II. of Aragon. About 5 miles from the town, at the foot of the mountain, is the famous lake, on the borders of which it is said

"Proserpine, gathering flowers,
Herself a fairer flower, by gloomy Dis
Was gathered."

The orators and poets of antiquity have exhausted their powers in describing the beauty and sublimity of this famous lake (see, among others, Cicero in Verrem, iv. § 48; Ovid, "Met." lib. v. lin. 385). But it no longer wears the liveliness of perpetual spring; its groves have been cut down, and its temples levelled with the dust! All is desolate and deserted:—

"Pro mollis viola, pro purpureo narcisso,
Carduus, et spinis surgit palustris acris."

Its naked borders are fetid and loathsome, and in the summer months exhale a pestilential air.

"Tantum ævi longinqua valet mutare vetustas."

Enna is said to have been founded by Syracuse in the seventh century B.C., but it is earliest noticed as a Sicilian city. It was subject to Dionysius of Syracuse in 403 B.C. In the wars between Rome and Carthage it suffered at the hands of the contending parties, and was delivered over to massacre and plunder by the Roman governor Penninus during the second Punic War. It was the headquarters of the revolted slaves under Ennius, during the first Servile War in Sicily, in 134 B.C. Here they defied for several years the power of Rome, and defeated three Pretorian armies. At last they were entirely defeated under the walls of Messina, by the Consul Piso; and Enna was subsequently taken by the Consul Rupilius, and the slaves put

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to the sword or crucified. In 859 A.D. it was betrayed into the hands of the Saracens, but passed to the Normans in 1080.

CASTRO, INEZ DE (died 1355), a beautiful but unfortunate lady, whose fate forms the subject of several tragedies and poems, was born in Spanish Galicia in the beginning of the fourteenth century. She was brought up at the provincial court of Juan Manuel, duke of Peñafiel, side by side with her cousin Castoia, the duke's daughter. On the latter's marriage to the Infante Don Pedro, son of Alphonso, the proud king of Portugal, Inez went to live with her at Lisbon or Coimbra. Don Pedro conceived a violent passion for Inez, and on the death of his wife, in 1345, secretly married her. The secret, however, became known, and the king, fearing the claims of young Ferdinand, Pedro's son by his deceased wife, might suffer, determined in council that Inez must die. The king went to Coimbra to see the sentence executed, but the sight of the beautiful Inez, with her children praying for mercy, made him relent for a few minutes. His advisers, however, obtained permission to carry out the sentence, and an hour later the unfortunate Inez fell a victim to their daggers. Don Pedro attempted a revolt against his father, but was pacified by the queen. On becoming king he caused Inez to be reburied in great state at Alcobaca, and a splendid marble monument was erected over her grave, surmounted by her statue wearing a crown.

CASUARINEÆ is an order of plant almost confined to Australia. They are trees or scrubby bushes, destitute of leaves, with the branches and twigs furrowed, and a whorl of scales at each joint, so that they have the appearance of arborescent *Equisetaceæ* ("Horse-tails"). The wood is very hard and durable, and from its red colour is known in Australia as "boof wood." *Casuarina equisetifolia* is the most widely spread species, for besides being a native of Australia, it is found all through tropical Asia, the Mascarene Islands, and Pacific Islands; it is also cultivated in warm countries. In Australia it is known as the Swamp Oak, and in the South Sea Islands it is appropriately named Iron Wood, from its hardness and colour. Dr. Seemann relates that the Etipians had used bark made of this wood in eating human flesh, while every other kind of food was eaten with the fingers. Besides this species, three others are native of the Malay Archipelago; the remaining nineteen species are not found beyond the limits of Australia and New Caledonia.

The order Casuarineæ is passed by Bentham and Hooker in the coherent Unisexuales of the division MONOCOTYLEDON. The flowers are unisexual, and arranged in spikes, the female spike opening into a kind of cone; they are in the axils of whorled bracts or scales, solitary, sessile, each with two bracteoles. In the male flowers the two segments of the perianth cohere at the top; the filament of the single stamen lengthens, and for some time is bent under the restraint, but at length it bends away the perianth from the base, and carries it up like the clypeus of a snout. In the female flowers there is no perianth, and the ovary is one celled, with two ovules. In the fruit the bracts and bracteoles increase and become hard, sometimes woody; when ripe, the bracteoles, which were before closed over the ovary, open to allow the winged nut to fall out. The nut is indehiscent, and contains a single exalbuminous seed.

CASUISTRY, the name of a science which professes to give rules for the resolution of doubts of conscience. It was greatly cultivated in the fifteenth and sixteenth centuries, especially by the Jesuits. The science of casuistry, however, though so liable to abuse that it has been termed, not improperly, the "art of quibbling with God," has been cultivated in the Reformed as well as the Papal Church.

It is, in fact, an ancient institution, not confined to any one church, country, or age. Aristotle treats of the

circumstances which render anger just, and of immoral obligations contracted under torture. Plato discusses the conflict of public duty with private affection, and of religious duty with political loyalty. The Talmud contains much unprofitable refining on morality. Chrysostom and Augustine were casuists, though the latter maintained that all lies were equally wicked. Among casuists in Great Britain may be mentioned Bishop Sanderson (in his Oxford Lectures "De Conscientia"), Bishop Taylor (in his "Ductor Dubitantium," or rule of conscience), Paley (in his "Moral Philosophy"), Keble (in his "Letters of Spiritual Counsel"), and J. H. Newman. For a full account of the casuists, see Mayer's "Bibliotheca Casuists," divided into three heads—Lutheran, Calvinist, and Roman. There was at one time a professor of casuistry in the University of Cambridge. Abbé Gaume ("Manual for Confessors," translated by Pusey and Fabes, 1875) and Cardinal Gousset ("Théologie Morale") have written the latest books on the subject. Amongst problems which are now regarded by many as within the sphere of casuistry are party obedience, anonymous journalism and authorship, espionage, some classes of privileged communications, pleading in court for prisoners whose guilt, if not actually confessed, is palpable; the treatment of lunatics, &c. Besides these general questions, there are occasions in the life of most men when the higher laws of morality come into collision with subordinate conventional ones. The hesitation as to what the path of duty is—what *ought* to be done—resulting from this collision, naturally and legitimately leads to many nice considerations which, if decided on under the guidance of a pure conscience, cannot result in harm.

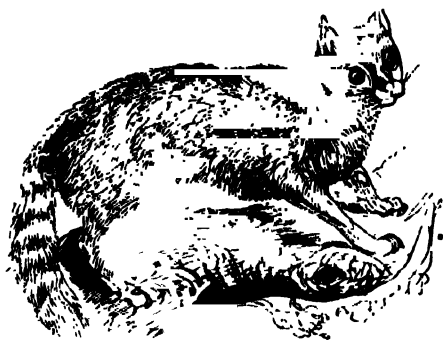
CAT, a name sometimes applied to the whole family *FELINÆ*, but more particularly restricted to some of the smaller animals in that family, as the domestic cat and its nearest allies. The origin of our domestic cat is shrouded in obscurity. By many writers this animal is regarded as the claimed descendant of the European wild cat (*Felis catus*). But there are grave objections to this theory. At the very time when the wild cat abounded in our island, the tame cat was both rare and dear, which would not have been the case when wild broods of young might have been procured with the greatest facility. We do not find the tame domestic cat among the animals enumerated by Cæsar as possessed by the ancient Britons in his day. The following quotation from Pennant is interesting as throwing some light on the controversy. The prince mentioned died A.D. 918, after a reign of thirty-three years over South Wales and of eight years over all Wales. "Our ancestors," says Pennant, "seem to have had a high sense of the utility of this animal. That excellent prince, Howell Ddu, or Howel the Good, did not think it beneath him, to give his laws relative to the prices, &c., of animals. (Liber Wallie," pp. 247, 248), to include that of the cat, and to describe the qualities it ought to have. The price of a kitten before it could see was to be a penny; if it caught a mouse, two pence. It was required, besides, that it should be perfect in its senses of hearing and seeing, be a good mouser, have the claws whole, and be a good napper; but, if it failed in any of these qualities, the seller was to return to the buyer the third part of its value. If any one stole or killed the cat that guarded the prince's grange, he was to forfeit a milch ewe and its lamb, or as much wheat as, when poured on the cat suspended by its tail (the head touching the floor), would form a heap high enough to cover the tip of the former. This last quotation is not only curious as being an evidence of the simplicity of ancient manners, but it also proves to a demonstration that cats are not *aborigines* of these islands, or known to the earliest inhabitants. The large prices set on them (if we consider the high value of specie at that time), and the great care taken of the improvement and breed of an

animal that multiplies so fast, are almost certain proofs of their being little known at that period."

It is well known that the common cat frequently betakes itself to the woods, and after a time assumes a semi-savage condition. This was at first considered sufficient ground for believing it to be identical with *Felis catus*; but when, on a closer examination, its characters were not found to have reverted to the state of those ordinarily present in the wild species, considerable doubt arose on the question. The colour of the fur is frequently indistinguishable, but a very marked dissimilarity is seen in the tail, which, instead of being uniformly thick throughout, as obtains in the wild cat, is, in the form under consideration, much narrower and tapering also toward the extremity.

The Egyptian or Gloved Cat (*Felis maniculata*), a species discovered in Nubia by the Frankfort naturalist Rüppell, has a good claim to the honour of being the ancestor of the domestic cat, both on account of its tapering tail and its size, in which it approaches more nearly the domestic form than *Felis catus*. Professor Owen, however, has pointed out peculiarities in its dentition sufficient at once to invalidate its claim. It seems best, therefore, in the present state of our knowledge, to consider the domestic cat as a distinct species under the name *Felis domesticæ*. Darwin points out that some naturalists, as Pallas, Temminck, and Blyth, believe that domestic cats are the descendants of several species commingled. "It is certain," he says, "that cats cross readily with various wild species, and it would appear that the character of the domestic breeds has, at least in some cases, been thus affected."

With regard to the cat it is to be noticed that distinct breeds, like those of the dog, are not found in the same country. This peculiarity is no doubt owing to its nocturnal and rambling habits, which prevent anything like selection. That this is not due to any deficiency of variability is proved by the existence of breeds more or less distinct in islands and in countries completely separated from one another. The well-known cats of the Isle of Man differ from common cats not only in the want of a tail, but in the size of their heads and the greater breadth of their hind legs. Ceylon, Paraguay, the Cape of Good Hope, China, all have their cats presenting striking differences from the common European cat. The varieties best known



Wild Cat (*Felis catus*).

as household pets in England are the Tabby, the Tortoiseshell, the Angora, with long silky hair, usually snow-white, and the Chinese cat, with a fine glossy fur and pendulous ears.

The domestic cat is so well known that a detailed description is unnecessary. Its habits are equally familiar.

The Wild Cat (*Felis catus*) is more or less abundant throughout the well-wooded and hilly districts of Europe, and was at one time very plentiful in these islands. It is still found in Wales, in the north-west counties of England, and more commonly in Scotland and certain parts of

Ireland. It is not quite 2 feet long, exclusive of the tail, which measures about 12 inches. The body is stouter than in the common house cat, the tail presenting an almost uniform thickness from one end to the other, except at the tip, where it is slightly swollen.

The fur has a yellowish-gray colour generally, but beneath the throat and belly it is nearly white; the sides of the body, the legs, the tail, and summit of the head being striped with brownish-black bands, which become lighter as they approach the ventral line. A longitudinal black band runs along the middle of the back, extending from the head to the root of the tail, this last-named organ being black at the tip. The wild cat was formerly considered in England a beast of the chase, as we learn from Richard II.'s charter to the Abbot of Peterborough, giving him permission to hunt the hare, fox, and wild cat. The fur in those days does not seem to have been thought of much value; for it is ordained in Archbishop Corboyl's canons, A.D. 1127, that no abbess or nun should use more costly apparel than such as is made of lambs' or cats' skins. It is reported, by those who have seen it in its wild haunts, to be extremely ferocious, a circumstance which has doubtless contributed to bring about its almost total extinction. The female produces four or five cubs at a birth, and selects either a hollow tree, a rocky recess, or, according to Sir William Jardine, a large bird's nest, for the protection and rearing of her young.

Cats have been domesticated in the East from a very early period. They are mentioned in a Sanskrit writing 2000 years old. The only notice of cats in the Bible is in the Apocryphal book Baruch (vi. 22). In this passage cats, in company with "bats, swallows, and birds," are represented as sitting upon the bodies and heads of the heathen gods in the temples at Babylon.

That a domestic cat was common in ancient Egypt we have abundant proofs in sculpture, paintings, and mummies embalmed with care. It was a sacred animal, and Diodorus relates an instance which he witnessed of a Roman being put to death by the populace for having involuntarily killed a cat. It was usual to embalm them, and bury them at Babastis, the city of the Moon, to which deity these animals were sacred. There is reason also to believe that they were trained to assist the fowler in the capture of birds. In the British Museum is preserved an ancient Egyptian picture, in which a cat is represented as being thus engaged, the fowler being in a boat on the water, most probably at the entrance of a decoy. From a careful study of the mummies, De Blainville has assigned the Egyptian cats to several species, one of which probably is identical with the Egyptian or Gloved Cat (*Felis maniculata*). This cat is the size of a moderate domestic cat, with a long tapering tail, and having the foot, soles, and hind part of the ankles and wrists shining black. In general colouring it closely approaches that of our gray-brown striped tabby cats.

The Pampas Cat (*Felis pajeros*) is extensively distributed over the South American plains, from the banks of the La Plata to the Straits of Magellan. It is about the size of the European wild cat, measuring 26 inches, exclusive of the tail, which is about a foot from root to tip. The fur is particularly long, the individual hairs being from 3 to 5 inches in length; it is of a pale yellowish-gray colour generally, and banded at the sides by numerous irregularly-disposed stripes of a brownish tinge. Along the central line of the back the hairs have a brownish-black colour, which is more or less continued on the tail. The head is comparatively small and rounded, the ears having a moderate development. The tail is short, thick, and rather bushy; but it does not exhibit any circular markings or spots. According to D'Azara, the natives call it *gato pajero* or jungle cat. It is said to feed chiefly upon guinea-pigs and other small mammals.

The Chaus or Jungle Cat (*Felis chaus*) has a wide geographical distribution, inhabiting Egypt, Persia, the borders of the Caspian, and also many parts of central and northern India. It is chiefly found in low marshy grounds and jungles, where it preys upon small quadrupeds and birds, and also, according to Rüppell, on fishes. The fur is comparatively long, loose, soft, and of a yellowish-gray colour. The tail is short, thick, and indistinctly marked by four or five alternating black and grayish white bands. These occur towards the extremity, which terminates somewhat abruptly; an approach is made to the lynxes in the ears, these being much pointed and slightly tufted at the summit by a pencil of fine black hairs about half an inch in length.

The remainder of the cat tribe will be noticed under FELINE.

CAT, as a symbol. The peculiar wildness which is never quite absent from the tamest cat accounts for the Roman use of the cat as the animal sacred to liberty. The goddess had her cat, just as Minerva had her owl. The worship of the cat in ancient Egypt, in connection with the moon goddess, has been traced by modern Egyptologists to the fact that the animal, like the moon, roams by night and sleeps by day, and its eyes grow large and bright by night, though by day they are often scarcely visible.

CAT, in proverbial usage. There are hosts of proverbs and sayings founded on the animal's peculiarities. Since the cat falls on its feet however thrown, the handy plate-warmer with six prongs, which has a like peculiarity, goes by the name of a cat. The *cat o' nine tails* seems more likely to be derived from the name *cat*, often given (possibly, *tac*, for *tackle*, reversed?) to the tackle of a ship (Brewer, "Dictionary of Phrase and Fable," recent, no date). So also Whittington's *cat* is believed by antiquaries to be the strong Norwegian-built, deep-waisted craft still called by that name, engaged in the speculations in coal, then a new fuel, by which Whittington is known to have amassed a large fortune, and the Moors of the tale. Professor Brewer thinks, are but the coal-heavers, blackened in their grimy pursuits.

But the proverbs "fighting like Kilkenny cats," alluding to a mutually ruinous contest between Kilkenny and Irish-town in 1690; "a cat has nine lives;" "grinning like a Cheshire cat," alluding to a long-lost fancy of shaping Cheshire cheeses in the form of a cat; "sick as a cat;" "to live a cat-and-dog life;" "a cat's sleep," and a hundred more, are genuinely from the animal's own characteristics, and show how thoroughly pass has sunk into our life.

We may add that the adage referred to by Shakespeare ("Macbeth," i. 7) in the often-quoted lines—

"Letting I dare not wait upon I would,
Like the poor cat in the adage,"

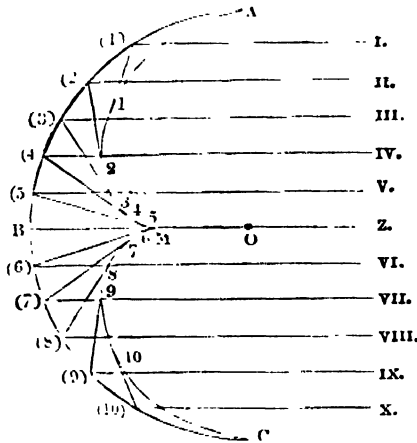
is the following—

"Catus amat pisces, sed non vult tingere plantas

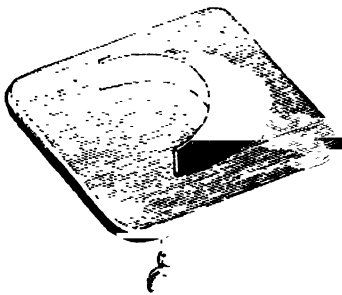
("The cat loves fish, indeed, but hates to wet her feet"). ("Heywood's Proverbs," 1666.)

CATABROSA, a genus of plants belonging to the order of GRASSES. The only species is *Catabrosa aquatica*. It is found in ponds, ditches, and wet sands. The common name is *sweet-water grass* and *whorl grass*. Cattle are very fond of it, and so are water-fowl. On account of the place of its growth, it is not adapted for cultivation. The spicules have two, sometimes three or four flowers, and are laxly paniculate. The two lower glumes are empty, broad, and rounded, much shorter than the flowering glumes. The flowering glumes have three prominent nerves; the palea is somewhat shorter than the glume, and has two distinct keels. The styles are distinct with plumose stigmas. The genus is included in the tribe Festuceae.

CATACAUSTICS, in optics, is a branch of reflection from concave mirrors. When a large fraction only of the spherical surface is employed as a mirror, the rays are not all collected to a point; their intersections, on the contrary, form a luminous surface, in optics called a *caustic*. The study of this subject is called catacaustics. A caustic may be well shown by half filling a common water tumbler with milk and illuminating the inner surface of the glass brilliantly, when the caustic curve is beautifully drawn on the surface of the milk. A caustic may be described more accurately thus:—When a number of rays proceeding from a point are reflected or refracted at or through any number of media, they will not, in most cases, be all thrown to the



same point again, but will be dispersed in such a manner as all to touch some curve or surface depending for its form and position upon the position of the luminous point, and the form and position of the reflecting or refracting curve or surface. Let a reflecting curve, $A B C$, of a semicircular form receive rays coming from a point on $A B$ produced, but at so great a distance that they may be considered as parallel. The rays, $I, II, III, \&c.$, strike the semicircle at (1), (2), (3), $\&c.$, and are then reflected in the directions (1) 1, (2) 2, (3) 3, $\&c.$ The curve, $A M C$, having a cusp at M , is constructed in such a manner that any ray whatsoever, moving parallel to $A B$, shall, after reflection at the circle, touch or graze this curve, which is therefore called the *caustic by reflection for parallel rays* of the semicircle, $A M C$. And the space, $A M C B$, will not be illuminated by any of the reflected rays coming from any point in $A B$, but only by those which come from a part of $B C$, which, after touching $C M$, their branch of the caustic, proceed and cut through $A M$. The consequence is, that the space, $A M C B$, will be much more highly illuminated than the exterior space; an effect which may be rendered



nated by any of the reflected rays coming from any point in $A B$, but only by those which come from a part of $B C$, which, after touching $C M$, their branch of the caustic, proceed and cut through $A M$. The consequence is, that the space, $A M C B$, will be much more highly illuminated than the exterior space; an effect which may be rendered

visible by placing a ring, with a bright anterior surface, upon a table, in the sunlight. It will then become evident, by a part of the table within the ring, of the form $A M C B$, becoming brighter than the rest, that the greater portion of the reflected light strikes the table within such a curve.

CAT'ACOMBS (from the Greek), subterraneous excavations used as vaults for the burial of the dead. They are found in most parts of the world, but chiefly in those countries which, like Italy, Sicily, and Egypt, offer extensive beds of soft *tufa*, or of some other stone which is easily cut, and which yet is adhesive enough not to fall in.

The catacombs of Rome are very numerous, at least thirteen distinct series of these underground cemeteries being known. The catacombs of St. Calixtus are the principal; the entrance into them is on the Via Appia, at a short distance from the city; they are very extensive, and have evidently been used both as burying-places and as places of worship, for Christian altars, inscriptions, and paintings have been found, and in part still exist, in these gloomy crypts. The long galleries, which twist and turn in a curious manner, are, generally speaking, about 8 feet high and 2 or 3 wide; there are mostly three tiers of graves or cells running lengthwise, one above another, along the galleries, and in some instances there are two and even three of these dark galleries beneath one another. According to Roman law, which forbade interment within the city, all these catacombs are without the walls, generally a mile or so away.

The catacombs of Naples, which are cut in *tufa* under the hill called Capo di Monte, do not differ materially from those of Rome, but their extent is not so considerable. At Chiunsi, Venosa, Palermo, and at Syracuse there are similar recesses, the catacombs of the latter place being very considerable. Catacombs are also found at Malta, and in the Greek islands of the archipelago. At Milo (one of the Cyclades) is to be seen a mountain completely honey-combed with them, a labyrinth of tombs running through it in all directions. From the bassi-relievi figures in terracotta, and other works of art found in them, it was evident that these tombs were of a date far anterior to the Christian epoch. In Egypt, especially at Alexandria, these subterraneous excavations occur in all parts of the country where there is rock, but they have neither the extent nor the form of those of Rome or Naples.

The catacombs of Paris could not be called catacombs with any propriety until recent times, when all the churchyards within the city were emptied of their contents, and the skulls and bones sent to the quarries beneath the city. The most recent and accurate work on the Roman catacombs are Rossi's "Roma Sotterranea," an exhaustive account (Rome, 1864 to 1877); Northcote's abridgment of Rossi, in English (Lond. 1879); Parker's "Archæology of Rome" (Lond. 1879); Roller's "Les Catacombes de Rome," two vols. (Paris, 1882), with not less than 100 heliogravures, obtained by the use of the magnesium light a method first employed by Mr. Parker.

CATALANI, MADAME ANGELICA, a very celebrated singer, was born at Sinigaglia in 1779, and educated in the convent of Santa Lucia, at Gubbio, near Rome. Here her marvellous voice attracted notice in the church service. Her power and clearness of singing were quite as remarkable as the compass of her voice, which reached to g''' in altissimo, and the unequalled rapidity of her execution of brilliant passages. She had a great command of pathos, but her forte was soon seen to lie in bravura. The celebrated "Rode's air with variations" was written for her. At the age of sixteen she was already prima donna at the *Fenice*, Venice, in 1795; and thence she travelled over all Italy, exciting the most unbounded admiration. In 1804 she went to Portugal at a salary of £3000 a year, and here she married Valabregue, a French military man attached

to the embassy, who treated his wife's marvellous natural gifts as a speculation, and deserves all possible dishonour for the injury he thus inflicted on art. The singer always retained her maiden name of Catalani. Much as we must condemn the absence of taste and of any feeling for the dignity and inner meaning of art in this extraordinary woman, it must be remembered to her credit that her character was unsullied in an age not remarkable for morality, and she had many noble and generous traits. She gave free instruction in singing to young girls for years at her villa near Florence in her retirement. In 1849 she went to Paris to avoid some political disturbances in Italy, and died there of cholera in June, at the age of seventy.

CAT'ALANS, THE, were a motley crew of Spaniards and nations subject to Spain, who from 1303 to 1307 kept Southern Europe in strife. The bulk of them were mercenaries too idle to work and too proud to beg when once their trade of war ceased to restrain them and set them loose upon society till peace became intolerable. Thus Frederick of Sicily gladly helped them to go to Constantinople, where the great contest with the Turks had begun; and the Greek emperor, who employed 8000 of them under Roger de Flor, rejoiced in the defeats of the Moslem due to their courage. One of these Catalans was known to cleave man and horse at a blow. The Catalans grew so numerous, so powerful, and so wealthy in this Asian war that the Emperor Andronicus became alarmed and ordered their dispersal. On their refusal to disband he created Roger duke of Roumanian, and invited him to Adrianople that he might share the empire; once in the trap, the Catalan leader was slain in the very presence of the empress and her ladies. The soldiers of Roger at once seized Gallipoli and held it for years, preying on the trade of the Hellespont. Eventually they retired to Athens, which they held for the remainder of the century, together with the neighbouring states.

CAT'ALEPSY or **TRANCE** (from the Gr. *catalepsis*, literally a seizing), to which is closely allied *ecstasy*, or the *ecstatic trance*, is a disease of the nervous system attended with an abolition of sensation and of intellectual operation, and with a peculiar condition of the muscles of voluntary motion, those muscles retaining during the paroxysm precisely the same position they were in at the moment of attack, while the action of the heart and the respiratory functions are but little affected. The malady consists of a great disturbance or an absolute suspension of the functions of the animal life, while the processes of the organic life go on with comparatively little change.

During the paroxysm, which commonly comes on quite suddenly, the patient retains precisely the same posture of the body as at the moment of the attack; even the expression of the countenance which existed at that instant remains unchanged as long as the paroxysm lasts; the eyes, whether open or shut, are perfectly fixed; any position in which any part of the body under the influence of the voluntary muscles may be placed, as the head, the trunk, or the limbs, is retained without the slightest deviation—this fixedness and unchangeableness in the attitude giving to the subject of the malady a most striking resemblance to a statue.

After a period of very uncertain duration, sometimes comprehending only a few minutes, and at other times many hours, occasionally, as is stated, even days, consciousness returns, generally with the same suddenness as that with which the attack commenced, the return to consciousness being accompanied with a sighing, and followed by pain or confusion in the head, and a sense of lassitude and fatigue. No memory is retained of anything that may have passed during the paroxysm; the very same train of ideas returning when consciousness is restored as was present at the instant it ceased.

The treatment of the malady must be different in every

different case, according to the particular condition of the system and the nature of the exciting cause. If some derangement of the physical health be the primary cause of the disease, as is almost always the case, the indications of which will commonly be found, if looked for, in the disturbed functions of the brain, the stomach, the liver, the uterus, &c., such remedies must be applied as are calculated to restore these diseased organs to a sound condition; and the treatment must be essentially the same if the intellectual or the moral health, or both, be deranged; for this latter derangement is almost invariably the effect of physical disease, and is wholly dependent upon it. Catalepsy has been known to assume an epidemic form in times of great nervous excitement.

CAT'ALOGUE, in astronomy. This is the name given to a list of stars, with the means of determining their positions annexed, whether latitudes and longitudes, or right ascensions and declinations. Such a catalogue is not only a register of the stars in question, but also gives the means of computing the effects of PRECESSION, ABERRATION, and NUTATION, and thus finding the absolute place of the star in the heavens at any given time. Another species of catalogue is a register only, being a list of objects which are looked at, not for the purpose of geography or navigation, but as connected with purely physical investigations, such as double stars, nebulae, &c. The places of the objects are only given to such a degree of nearness as will enable the future observer to lay his telescope upon them. We may place in this list all catalogues of comets.

Our whole actual knowledge of astronomy, so far as the position of the heavenly bodies is concerned, is contained in the catalogues of stars and the planetary tables, the latter of which furnish, not the places of the planets, but the elements by which those places are determined. The most important catalogue of stars is due to the astronomer ARGELANDER, who mapped 324,000 stars. Bessel mapped 32,000. Sir George Airy, astronomer-royal, and the British Association published not long since valuable catalogues. Herschel's catalogue of 6000 double and triple stars (principally southern) is a famous work.

A catalogue is the representation of observations, or rather of the mean of the observations, of a single person; and it is plain that the catalogues must be considered in a defective state if they do not agree with the observations of two good observatories, at least as well as these latter agree with each other. To give those who are not acquainted with the state of astronomy some idea of what actually results, we here subjoin the right ascension of some stars as observed and predicted, the last column being the result of the catalogue. The hours and minutes of course are the same; we give only the seconds and fractions of seconds—that is to say, the star is reported to have passed at a certain time by the sidereal clock, of which the hours and minutes are the same in all three, and the seconds and fractions of a second vary as follows:—

Day.	Star.	Greenwich Observ.	Edinburgh Observ.	Nautical Almanack.
Nov. 1	n Pisces	30°05 ^{sec}	30°12 ^{sec}	29°65 ^{sec}
—	p Pisces	16°00	16°05	16°07
Nov. 27	α^2 Aquarius	53°03	52°65	53°09
Nov. 28	α Pisces	55°68	55°22	55°81
Dec. 2	μ Cetus	5°04	4°86	4°92
—	σ Aries	9°09	8°55	8°18
—	j Taurus	49°61	49°61	49°81

In five instances out of seven the computation of the catalogue is seen to lie between the results of the observers.

A catalogue, such as is now constructed, shows at one given time the places of a number of stars in right ascension and declination, to which are usually annexed various auxiliary quantities to aid in the reduction of the catalogue to another epoch. These, though useful, are not necessary

parts, since they might be supplied by each person for himself, whereas nothing could replace the actual observation made at or near the epoch in question. A catalogue of stars has a value for all succeeding generations in proportion to its goodness. The comparison of two distant catalogues serves both to determine the precession of the equinoxes and the proper motions of the stars.

CATALOGUE, a list of books duly classified. The usual plan is to classify by authors' names, adding a small *catalogue raisonné*, or catalogue by subjects, as a sort of index to the general catalogue. A catalogue should contain particulars as to size, edition, and date of publication. Anonymous works are classified by their titles or subjects.

CATALONIA (in Spanish *Cataluña*), an old province with the title of *principality* in the north-east of Spain. It is now represented by the provinces of Barcelona, Tarragona, Lerida, and Gerona. The people of this part of Spain are distinctly marked as of different origin to the other inhabitants of the kingdom. They have at all times been conspicuous for industry, intelligence, and, above all, restlessness. They have always been ready to take an active part in the numerous internal conflicts that have aided so much to destroy the prosperity of Spain. Their province was the chief scene of the civil war in 1823, and it has formed a centre for most of the various Carlist rebellions.

The language of the Catalonians is a dialect of the Romance or Provençal at one time the common language in the south of France and in some other parts. But it is now a good deal intermixed with Castilian and other words. Letters were successfully cultivated at the court of Barcelona, and some of the counts attained to distinction as troubadours.

Catalonia had for a lengthened period its states, composed of the clergy, nobility, and commons, who shared the legislative power with the sovereign. It had also particular and very extensive privileges, and a peculiar form of jurisdiction in the hands of magistrates, called *viqueros*, whose districts are named *viqueries*. The highest court of appeal was the royal council established in Catalonia. Their contributions to the king were not considered as imposts, but as voluntary gifts; the Catalonians were to be tried by the laws of Catalonia only, and by native judges, and their estates were never to be confiscated, unless for treason.

It anciently formed part of the Roman province of *Hispania Tarracensis*. On the decline of the western empire, this territory was seized by the Gothic and Alani, from whom it is said to have been called *Goth-Alania*, whence by corruption the modern name. During a part of the eighth century Catalonia was held by the Moors till they were driven from it by Charles Martel, and afterwards by Charlemagne. The earls of Barcelona from that time held the sovereignty of Catalonia and the county of Roussillon; but on the death of Ramon Berenguer, whose son Aliso II. was crowned King of Aragon and Earl of Barcelona, Catalonia became annexed to the crown of Aragon, retaining, however, its own codes, laws, and usages. By the union of the crowns of Castile and Aragon the principality became a province of Spain, but held its privileges till the wars of the succession, in which the province, having sided with the Archduke Charles of Austria, was formally deprived of its courts and liberties by his more fortunate opponent Philip IV.

CATAL PA, a genus of plants belonging to the order **BIGNONIACEÆ**.

Catalpa bignonoides is a native of the southern states of North America, along the banks of rivers where it attains a height of from 40 to 50 feet, with a diameter of 2 or 3 feet. In that state its branches become long and naked, and the beautiful appearance of the tree at a younger age is lost. The wood takes a brilliant polish, and is very durable. It is of rare occurrence in the gardens of this country, but

when it thrives it forms a singularly beautiful tree, hardly exceeding 30 feet in height, and loaded in May and June with immense quantities of large trumpet-shaped white flowers, variegated with yellow and purple. Many such trees are seen on the west of London, Chiswick, Turnham Green, &c. It does not bear fruit in this country. *Catalpa longissima* is a tree 30 or 40 feet in height. It contains much tannin in its bark, and is considered serviceable in humoral asthma.

CATALYSIS, CATALYTIC or CONTACT ACTION, a term which has been applied by Berzelius to an obscure class of phenomena, in which a substance, by its mere contact, effects certain changes, either of composition or decomposition, without itself undergoing any change whatever. The action of yeast in fermentation has been considered an illustration of catalytic action. The action of diastase in the malting of barley, the conversion of starch into sugar by boiling with a very dilute acid, and the action of platinum in effecting the combination of hydrogen and oxygen, are all instances of catalytic action.

CATAMARAN is a name given both in the East and West Indies to some kinds of rafts which are used in short navigations along the sea-shore. Those used at Madras consist of three cocoa-trees lashed together, and are only large enough to carry one or at most two persons. On the coast of South America the rafts are from 70 to 80 feet long, and from 20 to 25 feet wide.

CATANIA (the ancient *Katana*), the capital of the province of the same name in Sicily, stands on the sea-coast, not far from Mount Etna, and has a population of 100,407. In ancient times Catania suffered greatly from earthquakes and the eruptions of Etna (Thucyd. iii. 16), as it has also done in modern times. The great earthquake of 1693 destroyed it, but the town has been since rebuilt. The streets are wide and regular, and the buildings are handsome, being mostly built of lava, faced with limestone and decorated with marble. Near the cathedral is a fine square, ornamented with an antique statue in lava of an elephant, bearing on its back an obelisk. The cathedral, dedicated to Santa Agata; the Benedictine convent of San Nicola d'Arena, which has long been justly celebrated for its vast extent, superb church, excellent organ, large museum, ancient mosaics, and great riches, and which is one of the finest buildings of the kind in Europe; the Palazzo del Senato or town-house—are the most remarkable buildings. Among the literary establishments of the city are a university, founded in 1445 by Alphonso of Aragon, a lyceum, a public library, a museum, and several collections of antiquities, natural history, medals, sculpture, and paintings. There are several ancient remains in Catania, among which is an amphitheatre. A spacious harbour has recently been constructed, and the trade of the port is flourishing. The exports are sulphur, grain and pulse, oranges and lemons, oil, silk, cotton, wine, dried fruits, &c. Catania is the seat of a bishop, has tribunals of commerce and appeal, and some silk factories. On many occasions the inhabitants have shown a singular unanimity in public affairs; they had the courage to practise inoculation so early as 1742, and to introduce the potato while an ignorant prejudice existed against it among their neighbours.

Catania is very ancient. It is believed to have been founded by the Chaldeians about the latter part of the eighth century B.C., and had Charondas for its early legislator. The citizens were driven out, B.C. 476, by Hiero I., who replaced them by colonies from Syracuse and the Peloponnesus, but they regained possession soon after the death of Hiero. Seventy-three years later Dionysius ravaged the city and sold the citizens for slaves, setting a body of mercenaries there. In the time of Cicero it had recovered its former wealth and prosperity, but having suffered severely from the ravages of Sextus Pompey, a little later a colony of Roman veterans were settled in it. Under

the Romans it was the residence of a prætor, and was adorned with many noble buildings. Owing, however, to the repeated occurrence of earthquakes, and the eruption of lava from Etna, its ancient monuments have been mostly destroyed; but the remains of its amphitheatre, the circumference of which exceeds even that of the colosseum, as well as of its theatre, odeum, hippodrome, temples, aqueducts, baths, &c., attest its former extent and magnificence. In later times it has suffered various vicissitudes of fortune. It was seized by the Goths, sacked by the Saracens, and ravaged by Henry IV., besides undergoing numerous sieges.

CATAPULT. See ARTILLERY.

CATARACT (*καταράκτης*, in its most common sense a fall of water over steep rocks, also a door that shuts to, a bolt, barrier, or obstruction, from *κατα-ήρυναι*, to break down or interrupt) is an opacity of the crystalline lens or its capsule, which obstructs the transmission of light to the retina, and, according to its degree, impairs or destroys the sight.

This disease is divided into *true* and *spurious* cataract. The latter term is applied to an obstruction which arises from an opaque film of purulent lymph thrown out by inflammation between the uvea and the capsule, often producing adhesion between these parts, and passing like a gauze blind across the pupil. The usual means which control inflammation in other cases may be used in this, and sometimes effect a cure, but no operation is applicable to it; it may arise from injury, and occurs occasionally in gout and rheumatism, and in some forms of secondary syphilis. The ancients appear to have considered all cataracts to be of this nature.

True cataract is of three kinds—*lenticular*, when the opacity is confined to the lens; *capsular*, when the capsule only is affected; and *capsulo-lenticular*, when both structures participate in the disease. The term, when used simply, is to be understood of the lens itself.

Lenticular Cataract.—An important practical division of this complaint is into the hard and soft kinds. Hard cataract is the most frequent, and is the variety usually met with in advancing age. Though called hard for the purpose of distinction, it may have any consistence—from that which is natural to the healthy eye, to the tenacity of wax. In this kind of cataract the lens is almost always diminished in bulk, so that upon examination it may be seen to lie at some distance behind the pupil, the movements of which remain free and unembarrassed.

Soft cataract is frequently single, and prevails in childhood and the middle period of life. In this form of the complaint the lens, instead of shrinking, commonly enlarges, so as to obliterate the posterior chamber and press the iris forward towards the cornea. Its texture is everywhere changed and softened: it may be converted into a turbid fluid, in which case the more opaque particles are sometimes observed to subside during rest; or it may have the consistence of soft cheese.

Capsular or Membranous Cataract commonly appears in specks or streaks of a pearly or chalk-white colour, without the bluish tint which prevails in the early stages of both the former kinds, and more frequently affects the anterior layer of the capsule than the posterior.

Capsulo-lenticular Cataract, or that in which both structures are implicated, is much more common. In such cases the lens is usually in the softened state already described. Congenital cataracts are generally of this nature; the opacity, if not *central*, being uniformly diffused, and the consistence never greater, and usually much less, than in the healthy state. It frequently prevails among members of the same family, and has a peculiarity which renders an early performance of an operation of essential importance. This consists in a constant rolling and unsteady motion of the eyeball,

which may become habitual, and preclude the patient from ever acquiring the power of directing the eyes at will towards an object.

The symptoms experienced by a person affected with cataract may readily be imagined. The symptom first perceived is a dim haziness of sight, as if a mist or a thin veil were interposed between the object and the eye. The obscurity is greatest in direct vision; in hard cataract, because the opacity is originally central; in soft, because the direct rays pass through the thickest part of the lens, while those which enter laterally are transmitted nearer to the edge, which is comparatively thin. The sight is better, for the same reason, in weak light, and with the back turned to the window, than in strong light; for the pupil in the latter case is contracted, and permits the passage of the rays only through the middle of the lens. Hence also the advantage derived in all cases from occluding the eye with belladonna, or the deadly nightshade, into the eye, which, with some other sedative vegetable poisons, has the remarkable property of dilating the pupil by some specific action on the iris independently of the retina. The relief, however, is only temporary, although the effect is but little impaired by repeated applications. The treatment is a favourite one with quacks, who have made much capital out of it.

None of the varieties of true cataract are subject to the influence of any known medicinal remedy, whatever may have been put forward to the contrary to serve interested purposes; nor is it at all likely that any remedy exists with powers capable of acting upon parts so obscurely organized and so completely out of the course of the circulation. The only way of effectually curing cataract is by operation. This may be effected by extracting the lens, or by displacing it from the axis of vision, or breaking it up and causing its absorption.

CATARRH or **CORYZA**. See COLD.

CATAR RHINE is the name applied to those members of the order QUADRUMANA who have their nostrils placed close together, and separated only by narrow gristle. This term includes all the monkeys of the Old World.

CATASE TUM is a genus of ORCHIDS which is remarkable on account of its varied sexual forms, which are so unlike that they were at first placed in different genera, though later they have sometimes been found upon the same individual. The pistillate form was called *Monacanthus*, the hermaphrodite *Myanthus*, and the staminate *Catasetum*.

CAT-BIRD (*Mimus felineus*) belongs to the division DENTIROSTRIS of the order PASSERIS, and is nearly allied to the well-known MOCKING-BIRD. This bird owes its name to its singular note, resembling that of "some vagrant orphan kitten bewildered among the briars," which it is fond of uttering. The cat-bird is a bird of passage in the United States, in the southern parts of which it arrives as early as the end of February; it takes up its abode in the thickets, and feeds both upon insects and fruits, resorting to the gardens in search of the latter. The nest is placed in a thick bush, and resembles that of the mocking-bird in its construction.

CATCH, in music, a composition of the humorous kind for three or four voices, in which each voice sings the whole melody, but the different voices take different portions of it at any given time. In fact, the catch is the common variety of the ROUND. The words "catch" and "round" are each other so as to produce a ludicrous effect. Walter the Calfeote composed some good catches. "Would you know my Celia's charms?" by the first, and "Ah how, Sophia (a house a-fire), can you leave," by the second, are favourites to the present day. The catch was the favourite form of light music in Charles II.'s day, but the words then approved seem to us highly objectionable, and all the older catches have passed into the domain of the antiquary.

CATECHINUM. This peculiar principle is obtained, not merely from catechu, strictly so called, but also from gambier and some kinds of cinchona bark. The best mode of procuring it is to digest catechu in sulphuric ether, then evaporate the ether, wash the residuum in cold water, repeatedly dissolve it in boiling water, and by renewed evaporation procure it pure. It is persistent at the ordinary temperature of the air, but by long exposure to damp it resolves into a mould-like mass. At a moderate heat it melts into a transparent fluid, and at a strong heat it becomes brown. Catechinum is valuable as an application to check the flow of blood from leech-bites, scarification of the gums, &c.

CATECHISM. To *catechise* comes from a Greek compound word denoting the reflection of sound (κατη-χίζω, to din into one's ears), and signifies the mode of instruction by question and answer without book. St. Paul has used the word in his First Epistle to the Corinthians, xiv. 19, "that by my voice I might teach others" (κατήχου). *Catechising*, then, etymologically and according to the primitive usage, is delivering orally instruction in matters pertaining to religion.

What, in the infancy of Christianity, was the mode of communicating the elements of Christian truth to persons of all ages, has become in process of time the mode of making such communications to the minds of children only. Children, generally speaking, are now the only persons who need this kind of instruction; and when we use the terms *catechise* and *catechumens*, which last word denotes the persons placed under this mode of religious instruction, we refer them at once to children, and children only. The greater extension of the ability to read has also produced another change. Catechisms, originally intended for the use of the instructor, have been transferred to the instructed, who have learned in them the answers which beforetime they were wont to have only from the mouth of the teacher. The most celebrated among ourselves of these catechisms is that which is incorporated in the Book of Common Prayer, an intimate acquaintance with which is held to be essential to every person who is a candidate for confirmation. The Assembly of Divines at Westminster, who at a time when Presbyterianism was in the ascendant in England, were called together to devise a new form and order of Christian profession, put forth two catechisms: a larger, containing a system of Christian doctrine, with the evidence on which its several parts were supposed to rest; and a smaller, which was intended for the actual catechetical instruction of the young. There are numerous other catechisms, both Protestant and Roman Catholic, some doctrinal, some controversial, some devoted to particular subjects, as the sacraments, or to particular purposes, as the preparation of candidates for admission to the Lord's Supper; some adapted to the capacity of very young children, &c. The opinion, however, has become prevalent that doctrinal abstracts are not the best form in which religion can be presented to the young, and the use of catechisms has accordingly been in some measure relinquished in favour of other methods of instruction. Under the provisions of the Education Act passed in 1870, catechisms of every kind are strictly prohibited in all rate-aided schools in England and Wales.

CATECHU is an extract from *Acacia Catechu*, *Uncaria Gambier*, or from *Arcea Catechu*. The inspissated extract of the *Arcea Catechu* is also known as Cutch and Terra Japonica.

At the season of the year when the sap is most perfectly elaborated, the bark of the *Acacia Catechu* is removed, and the tree cut down, the outer white part removed, while the inner wood is digested in water, and an extract obtained by the application of heat. It is a powerful astringent, and is very useful in all cases of relaxation of the tissues. But its most important commercial use is as

a dye and tanning drug. It owes these properties to the large amount of tannic acid it contains, amounting occasionally to more than half the weight of the substance. It is said that 1 lb. of catechu has as much tanning power as 7 or 8 lbs. of oak bark. See *ACAIA*.

Pale catechu, or gambier, is the extract obtained from the leaves of the plant *Uncaria Gambier*, which is chewed by the natives, mixed with areca and betel-nut; and the use of it is extensive throughout India and the islands of the archipelago. The *Uncaria Gambier* is a shrubby plant which grows about 6 or 7 feet high. It is cultivated at Singapore and the neighbouring islands. The leaves, on being well boiled, yield the gambier extract, which being poured into moulds hardens for use. The extract has a sweetish taste, and possesses a pleasant aromatic flavour. Its chief value in this country is its use in dyeing and tanning. The reactions of catechu are so varied that it is now used for most compound colours, as black, brown, green, drab, and fawn; and its permanency renders it of high value. It was first used for dyeing brown upon cotton. It is more readily soluble than catechu, and more powerful than kino. As a medicine, it is a remedy in chronic diarrhoea and dysentery, and also in relaxed conditions of the uvula and palate. See *UNCARIA*.

Ceylon catechu is obtained from the fruit of the *Arcea Catechu*. See *ARCEA*.

CATECHUMENS (from the Gr. *katēchoumenoi*) was the name given, in the early Christian church, to those who were being instructed in the doctrines of Christianity, in preparation for the ceremony of baptism.

The Catechumens were divided into four classes:—1. Those impressed by what they had heard of Christianity and anxious to hear more, and to whom instruction was given privately. 2. Those who had been so instructed and were admitted to the churches to hear the sermons, exhortations, and reading of the Scriptures, and were called *audientes* (hearers); these left the church when the sermon had been concluded. 3. The third class consisted of those who had formally demanded baptism and were allowed to share in the prayers of the congregation, and hence were termed *genuflectentes* (kneelers). 4. The fourth class was the *electi* or *competentes*, as being those who had completed their probation and had been approved by the bishop as candidates for baptism on the first opportunity. The term was afterwards applied to young members of the Christian Church who were receiving religious instruction to prepare them for confirmation or for admittance to the mystery of the eucharist or Lord's Supper.

CATEGORY. The Greek word *kategoria* (*katēgorein*, to declare, to aver) was used by Aristotle to denote a class of things concerning which some one common assertion may be made, or, in other words, which are susceptible of the same predicate. Aristotle's book of categories is the first of the six which compose the "Organon," though some modern writers have supposed that he is not its author.

Aristotle and the Peripatetics in general proposed the categories merely as comprehensive forms of predication, by which the perplexing variety of human ideas was supposed to be conveniently arranged for the use of the dialectician. All the objects and modes of human thought were thus distributed as species under ten universal terms, to facilitate a comprehensive survey of the whole physical and metaphysical world, known and unknown. The names of the ten categories, as enumerated by Aristotle, are:—Substance, Quantity, Quality, Relation, Action, Passion, the Where, the When, Position in space, Possession. The first four categories are elaborately explained by Aristotle; the definition of the remaining six is soon despatched; but the nature and properties of all are more fully defined incidentally throughout the rest of his works. In the latter ages of Latinity these categories were denominated *Prædicaments*, the name by which they have since been generally

designated in the scholastic works on logic, in which they are usually translated and placed as follows: "Substantia, Quantitas, Qualitas, Relatio, Actio, Passio, Ubi, Quando, Situs, Habitatio."

As to the utility of these ten categories, it may be remarked that they form an essential part of the artificial system of logic, which, after reigning paramount during the dark and middle ages, was rejected as useless by most of the principal philosophical writers of the last three centuries. John Stuart Mill has pointed out ("System of Logic," i. 3, 8th edit., 1872) that this division of knowledge is both redundant and defective. Some predicates are omitted, and others are repeated several times under different heads. "It is as if we were to divide animals into men, quadrupeds, horses, asses, and ponies."

Mill's own classification of propositions is into the following:—Those regarding Existence, Co-existence, Sequence simple or Sequence causative, and Resemblance. Under one of these four heads every statement comes. Existences or describable things he further defines as being either Feelings (states of consciousness); Minds, which experience feelings; Bodies, which excite feelings, so far as sensations are concerned; and Successions or Co-existences, with Likenesses and Unlikelinesses, which excite the remainder of the feelings. In the Categories of Kant ("Kritik der Reinen Vernunft," Abbott's translation, 1874), the precise boundaries of human knowledge, *à priori*, are professed to be exhibited. These Categories consist of four primordial classes: 1, quantity; 2, quality; 3, relation; 4, modality; each class containing three categories: 1, unity, plurality, totality; 2, reality, negation, limitation; 3, substance and accident, cause and effect, action and reaction; 4, possibility, existence, necessity. Kant considers that these are the pure forms of the understanding. They render thought possible, they are the investitures bestowed by (1) the understanding, or the power of judgment, on the materials furnished by (2) sensibility. Reason (the power of ratiocination) completes Kant's threefold division of mind.

CATENARY (Lat. *catena*, a chain) is the curve in which a string of perfect flexibility and uniform thickness and density will hang from two points, which we may suppose to be in the same horizontal line, as the nature and properties of the curve will be the same from whatever points it may hang. And all catenaries are similar curves; that is to say, let there be any number of such curves formed by chains of different lengths, then each of them will be a picture, on a reduced or enlarged scale, of the longest. The chief properties of a catenary curve are these:—1, The tension at any point of a uniform cord hanging in a catenary curve is equal to the weight of a portion of cord the length of the distance of that point from a horizontal line which is drawn touching the curve at its lowest point; 2, the horizontal tension at any point is constant; 3, of all curves of a given length drawn between two fixed points in a horizontal line the common catenary is that which has its centre of gravity furthest from the horizontal line.

CATERPILLAR, a name given to the larval state of butterflies and moths. As this term is therefore of partial application only, whilst that of larva is applied to the second stage of all insects (*i.e.* that which follows the egg), an account of it is given under LARVA.

CATERPILLAR EATERS (Campephagidae) is a name applied to a family of birds belonging to the order PASSERES and the division DENTIROSTRES. This family is peculiar to the Old World, and attains its greatest development in Australia and the adjacent islands of the Malay Archipelago. It is well represented in Africa and India, but is absent from Europe and Northern Asia. The bill is short and depressed at the base, and the rump feathers have their shafts stiffened. The tail is long and rounded.

The White-shouldered Caterpillar Eater (*Campephaga humeralis*) is a summer visitor to the south of Australia, in all parts of which it is common from September to January. It is active and lively, and has a pleasing song, which it emits constantly during its search for food; this consists of insects, which it captures on the wing, on the branches of trees, and on the ground. The nest of this bird is small and cup-shaped; it is composed of fragments of bark, short twigs, and grasses, interwoven with other fine vegetable fibres, moss, and cobwebs; it is placed on the forked branch of a tree, and so arranged that it is not easily detected from below. The whole length of the bird is about 7 inches. The two sexes differ greatly in colour. The male has the upper parts black, with the rump gray and the lower parts white; the shoulders and upper wing-coverts are white, forming a broad band along the wing. The female is brown above and buffy white beneath. The bill and feet are black, or blackish in both sexes, palest in the female. Several other species of this genus are found in Australia.

The Gray Caterpillar Eater (*Campephaga fimbriata*), an inhabitant of the woods of India, is about the same size as the preceding species; it is of a slate colour, with the head, wings, and tail black, the latter bronzed; and the tail has a gray spot at the tip of each of the outer feathers. The principal food of this species is caterpillars, grubs, and other soft wingless insects; but it also feeds on winged and even hard-shelled insects, and on berries and seeds.

The Lobed Caterpillar Eater (*Campephaga lobata*), which is an inhabitant of Sierra Leone and other parts of the west coast of Africa, is remarkable for having a large, red, naked wattle at the base of the bill in the male.

The Crimson-rumped Caterpillar Eater (*Pericrocotus peregrinus*), an abundant species in India, is about 6 inches in length, of a gray colour above, with the rump crimson, and white beneath; the wings are brown and the tail black, with the tips of the four middle feathers yellow. This bird is met with in the jungle, and in hedges and groves of trees; it is restless, lively, and active, resembling a tit in its habits; it feeds on insects, especially larvæ, which it captures on the trees.

CAT-FISHES (Siluridae) is a family of fishes belonging to the order PISCESOMI. In this family the skin is usually naked, though a few species are cased in bony plates or scutes, and some are protected by a row of these plates along the lateral side. All these fishes have the mouth supplied with barbels, which are probably their organs of touch. The two principal barbels are on the upper lip, and formed by elongation of the inter-maxillary bones. The air-bladder is connected with the organs of hearing by chains of ossicles. In the development of the fins there is great variety. There is sometimes only one dorsal, but more commonly two; the second being adipose, or in a few species only supported in front by a bony ray; the caudal is forked, crescentic, or rounded at the end. In almost all cases the first pectoral is a strong, bony, serrated ray, capable of inflicting a severe wound; and a similar strong ray often stands in front of the dorsal, and is not unfrequently furnished with a trigger-like apparatus for fixing and releasing it at the pleasure of the fish. The skeleton of the Siluridae presents many peculiarities.

This family includes numerous genera, and each genus numerous species, inhabiting the lakes and rivers of warm regions. The more important genera and species will now be briefly described.

In the genus *Clarias* the dorsal and anal fins are very long, the dorsal extending from the neck to the caudal fin. The head is depressed, its upper and lateral parts being bony, or covered with only a very thin skin. From the gills springs a branching supplementary bronchial organ, the function of which is unknown. Twenty species of this genus are known from Africa, the East Indies, and

some parts of Asia. A species inhabiting the Nile is known in Egypt by the name of Carmoot.

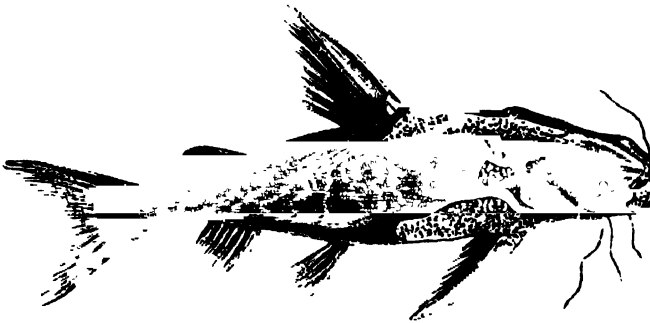
The genus *Silurus*, containing the SHEAT-FISH (*Silurus glanis*), has the dorsal fin very short, and the head and body covered with a thin skin.

The genus *Hypophthalmus* is composed of but few species, from the tropical portions of South America. The mouth is devoid of teeth. The eyes are situated behind and below the angle of the mouth. The dorsal fin is very short and has seven rays.

The genus *Bagrus* contains two species common in the Nile, and both attaining a length of 5 feet and upwards. The adipose fin is long and the dorsal short. The palate is provided with teeth.

The genus *Pimelodus* contains numerous species found both in the Old and the New World. It differs from *Bagrus* in having no teeth on the palate. The species vary as to the length of the adipose fin and barbels, and the strength of the dorsal spine.

The genus *Arius* contains about seventy species, which



Arius Rita.

are found all over the tropics in countries drained by large rivers; a few species are marine. The species figured is common in the mouths of the Ganges. It is strongly mailed, and attains a length of 4 feet. The females of this genus, and of several allied genera, deposit large eggs, from 0.5 to 0.6 of an inch in diameter. Mr. F. Day makes some interesting observations on the care displayed by the male fishes for these eggs:—"While examining the fishes along the western coast of India, I found many of the males of this group with from fifteen to twenty of these large eggs in their mouths. Some of these eggs were in an early state of development, others ready for hatching, while one example contained a young fry hatched, but having the yolk-bag still adherent. They filled the cavity of the mouth and pharynx of these male fishes. Whether the male carries these eggs about in his mouth until they are hatched, or merely removes them from some spot when danger is imminent, of course may be open to question; but it is a significant fact that in none of the examples which I dissected could I find a trace of food throughout the intestines of the males who had been engaged in this interesting occupation."

The genus *Doras* is the most powerfully armed of all the cat-fishes, having bony plates along the lateral line, each terminating in a spine, and also bony plates covering the upper surface of the head and extending to the dorsal fin. About twenty-five species are known, the most being from tropical America. These fishes have the habit of travelling in the dry season overland in search of water, moving over the meadows in dense columns, and when the ponds dry up burrowing into the mud. As they have no special organs for carrying a supply of water with them, they must retain the water necessary for life either between the plates of their bodies, or by closing the gill openings. In the rainy

season they make regular nests of leaves, and carefully cover up their eggs, which, during the process of hatching, are assiduously watched and courageously defended by both males and females.

The genus *Callichthys* has similar habits.

The genus *Malapterurus* comprises the ELECTRIC CAT-FISHES, which inhabit the rivers of tropical Africa. The single dorsal fin is adipose, and situated before the caudal. The palate is toothless.

The genus *ARGES* (figured in the Plates *PHYSOSTOMI*), with several allied genera, inhabits the lakes and streams of the Andes. These fishes are killed by the escape of gases during an eruption, and are swept down to the plains in such numbers as to cause in decay fatal epidemic fevers.

The genus *Loricaria* (see Plates *PHYSOSTOMI*) contains about twenty-six species, from tropical America. A coat of mail, formed of large angular bony plates, encases the head and body. The mouth is situated under the snout, and is bordered anteriorly by the maxillaries and premaxillaries; both these bones and the mandible are set with long flexible teeth, and a broad fold of skin surrounds the orifice of the mouth; the branchiostegals are four in number, and the gill-cover is generally immovable. There is one short dorsal fin.

The genus *Aspredo* is remarkable for the care the females take of their progeny, a rare virtue among fishes. "During the time of propagation," says Günther, "the integuments of the lower side of the flat trunk of the female assume a soft and spongy texture. After having deposited the eggs, the female attaches them to and presses them into the spongy integument, by merely lying over them. She carries them on her back, as the Surinam toad (*Pipa*) carries her ova on the back. When the eggs are hatched

the excrescence on the skin disappears, and the abdomen becomes as smooth as before." In this genus the head is covered with soft skin. There is no adipose fin. The dorsal fin is short, the anal very long.

The species of the genus *Stegophilus* are found in the gill-cavity of larger fishes; but Günther thinks it probable that they enter these cavities "only for places of safety, without drawing any nourishment from their host." They have the operculum armed with short stiff spines, the function of which is probably to enable the fish to attach itself to stones in rapid currents, and so maintain its place. The dorsal and anal fins are short.

CAT-GUT is the name given to cord of great toughness, prepared from the intestines of sheep, rarely from those of the horse, ass, or mule, but *never* from those of the cat. The word has nothing to do with *cat*, being a corruption of *gut-cord*. It is used for the strings of violins, harps, guitars, and other musical instruments, and also for hanging clock weights, for lawn-tennis bats, bow-strings, and various other articles where its special qualities of toughness and durability are required. It is necessary, in preparing it, to clean the intestines well and free them from fatty matter, then to thoroughly soak them in water, and afterwards to scrape off the external membrane with some blunt instrument. They are then steeped in water and again scraped, after which they are treated with a dilute alkaline solution, and lastly tightly twisted and drawn through perforated thimbles and sorted into sizes. To destroy any animal matter remaining, the intestines are further subjected to the fumes of burning sulphur, which prevents decomposition. The best strings for musical instruments are imported from Italy, and are known as Roman strings. They are as clear and transparent as glass.

CATHA. See *CELASTRINEÆ*.

CATHARINE I. of Russia. See PETER THE GREAT.

CATHARINE II., ALEXIEVNA, born in 1729, was the daughter of the Prince of Anhalt Zerbst. Her name was Sophia Augusta von Anhalt. She married in 1745 her cousin Charles Frederick, duke of Holstein-Gottorp, whom his aunt, the Empress Elizabeth of Russia, had chosen for her successor. In adopting the Greek communion he took the name of Peter, afterwards Peter III., and his consort that of Catharine Alexievna. It was an ill-assorted and unhappy match. In consequence of many disagreements with his wife, as soon as Peter came to the throne in 1761, by the death of the Empress Elizabeth, he talked of repudiating Catharine. She anticipated him by a bolder movement. A confederacy was formed; the emperor was arrested, and Catharine was proclaimed sole empress of all the Russias, Peter having signed an act of abdication in July, 1762, and six days afterwards he was strangled. Catharine was solemnly crowned at Moscow in 1762. It is not necessary to enter on her private life, further than to acknowledge it to have been exceptionally licentious even for that age. It remains to record the principal acts of her reign, which was a most important one for Russia and for Europe. In 1763, on the death of the weak and indolent Augustus III., king of Poland, she succeeded in procuring the election of one of her favourites, Poniatowski, who was chosen king under the name of Stanislaus Augustus. Discontent and revolt followed, in which the Russian army interfered, and after a state of anarchy, war, and pestilence of many years' duration, the first partition of Poland, concerted between Catharine, Frederick of Prussia, and Joseph II. of Austria, was effected in 1772, and was sanctioned by a subservient Polish diet. Meantime the war with the Turks had proved highly successful to the Russian arms, both by sea and by land. Romanzov defeated the Turks on the Pruth, and the Russian fleet in the Mediterranean defeated and burned the Turkish fleet at Tchesmé in 1770. By the peace of Kainarji, July, 1774, Azof and Taganrog were ceded to Russia, and the Crimea was declared independent of Turkey. In 1785 the Russians took the Crimea for themselves. Soon after the Turks commenced a new war against Russia, in which they were joined by Sweden, but they were defeated everywhere; they lost Oczakow; Suwarrov took from them Ismail by storm in 1790; and at length by the peace of Jassy, 1792, the frontiers of Russia were extended to the Dniester. Meantime the Poles, taking advantage of the war, abrogated the articles of the diet of 1772, and in 1792 formed a new constitution, against which some of the nobles, Catharine of Russia, and the King of Prussia protested, and the result was a second partition of Poland in 1793. In 1794 an insurrection broke out at Warsaw, and the gallant Kosciuszko placed himself at the head of the Poles. After being successful at first, he was defeated, wounded, and taken prisoner. Warsaw surrendered, and the third and last partition of Poland took place in 1795.

Catharine now promised to send troops to join the coalition against France, when, 17th November, 1796, she died of an apoplectic fit, after a reign of thirty-five years. Her personal and private history was one noted for shameless sensuality. She was succeeded by her son Paul I.

In the internal administration of her vast empire Catharine effected much good. She was the great regenerator of Russia next to Peter I., but with a more enlightened mind and under more favourable circumstances than that emperor. She began several canals and founded numerous towns, docks, arsenals, banks, and manufactories, and she encouraged learning. The most remarkable of her own works is her "Instructions to the Commissioners appointed to frame a new Code of Laws for the Russian Empire," which were translated into English by M. Tatischeff (London, 1768).

CATHARINE DE' MEDICI, daughter of Lorenzo de' Medici, son of Piero, grandson of Lorenzo the Magnificent, and nephew of Leo X., was born in 1519. In 1533 she was married to Henry, second son of Francis I. of France. In 1547, on the death of his father and brother, Henry II. ascended the throne, and Catharine became queen of France. Catharine had by her husband five sons, of whom three reigned successively over France—Francis II., Charles IX., and Henry III. During the short reign of Francis II., who succeeded Henry II. in 1559, the chief influence at court was in the hands of the Guises. But when, by the death of this prince in 1560, his brother Charles IX. ascended the throne, Catharine, as regent, became the real ruler of France, and is accountable for all the mismanagement and atrocities of that reign, and above all for the horrible massacre of the Protestants on St. Bartholomew's Day, 1572. Charles IX. died in 1574, and his brother, Henry of Valois, left Poland (where he had been elected king by the Diet), and returned to France, where he was crowned in 1575. Henry III. was a weak and corrupt prince, and his reign was distracted by the intrigues of the queen-mother and of the Guises, by the civil wars between Protestants and Catholics, and by the war between France and Spain. Catharine favoured sometimes one party and sometimes the other, and at last assassination was resorted to in order to get rid of the Guises. The Duke of Guise and the cardinal, his brother, were murdered at Blois in December, 1588, by order of the king. Catharine herself died at Blois, January 5, 1599, an object of aversion to all parties. The French modified her name to "Catherine de Médicis."

CATHARINE OF ARAGON. See HENRY VIII.

CATHARINE PARR. See HENRY VIII.

CATHARINE, ST., was the daughter of a dyer at Siena. She was born in 1347, and became the spouse of Christ in a vision, and took a vow of perpetual virginity at eight years old. "The Marriage of St. Catharine" is a favourite subject with the great masters. She became a Dominican nun, and rose to great celebrity for her visions, her charity, and sanctity, and also for her considerable ability. From a crucifix, still preserved at Siena, she is held to have received miraculous repetitions of the wounds of Christ (*stigmata*). Her writings were numerous. She undertook a mission, when only thirty years of age, to bring back the popes from Avignon to Italy; and marvellous to relate, the young woman, by her force of character and her enthusiasm and single-hearted eloquence, actually accomplished this apparently impossible task, and the "seventy years' captivity" came to an end. Such a fiery spirit soon wore out the frail body, exhausted by vigils and fasting, and Catharine died in 1380. Pius II. (Eneas Sylvius) canonized her in 1461. A collected edition of her works was brought out at Siena in 1707 in four vols. 4to.

The **CATHARINE-WHEEL**, a well-known firework, is in commemoration of another St. Catharine, an Egyptian princess, put to death by the Emperor Maximin in 307, as a Christian, by breaking on the wheel and burning.

CATHARINE HALL, Cambridge, was founded in 1475 by Robert Woodlark, D.D., chancellor of the university and provost of King's College, who endowed it for a master and three fellows. The foundation was afterwards enlarged by other benefactions, but principally by the endowments of Mrs. Mary Ramsden, of Norton and Fockerby, in the county of York. The statutes, confirmed by order of the queen in council, 10th May, 1860, provide that there shall be a master and nine fellows. There are ten scholarships of £10 a year, two of £50, and nine of £25. All are perfectly open to candidates from any school or place of birth. There are four livings in the gift of the society.

Catharine Hall is a brick edifice, situated on the west side of Trumpington Street; the buildings occupy three sides of a court, the east side being open to the street.

The college was rebuilt about 1700, and the chapel was consecrated in 1704. In 1869 the hall was metamorphosed from a room of Queen Anne's time into florid Gothic, and the rest of the college has undergone a similar renovation.

CATHARTICS. See APERTIVES.

CATHCART, a village in Scotland, in the counties of Renfrew and Lanark, on the White Cart River, 2 miles S. of Glasgow. From the Castle of Cathcart, now in ruins, Mary Queen of Scots watched the fortunes of the battle of Langside, which, ending in the defeat of her friends, was the last warlike effort she was able to make. The battle was fought in 1568.

CATHEDRAL, or **CATHEDRAL CHURCH**, is so called from its having a seat of dignity within it appropriated to the bishop or archbishop. The name is derived from a Greek word, *cathedra*, seat, lecture-desk, or pulpit. Thus, to speak *ex cathedra* is to speak as from a seat of authority. Between cathedrals and collegiate churches the main difference is in the fact of the see of the bishop being at the former. The dean and chapter constitute the governing body of cathedrals, the chapter consisting of the canons, who with the dean, meet for corporate purposes in the chapter-house of the cathedral. The bishop is president or "visitor" of the dean and chapter. Canons must reside three months in each year, the income being, in the case of Durham, Manchester, St. Paul's, and Westminster, £1000 per annum; at all other cathedrals, £500. Honorary canons have no emoluments, but rank after canons. The daily choral services of the cathedral are conducted by minor canons, of whom there are from two to six in each diocese. See **ENGLISH CATHEDRAL ARCHITECTURE**.

These **CATHEDRAL SERVICES** contain a very fine body of music, composed from the Reformation onwards for the service of the English Church. In many cases the music is not so much composed as altered and adapted from the Roman Catholic musical service previously in use, and made to fit and blend with the new responses and prayers in the vulgar tongue. Of such are the celebrated psalter by Marbeck, and the litany of Cramer, with musical notation. During the Tudor times it was not uncommon for thrifty musicians, who were forced to sail with the voyaging breezes, to write music such as could readily be arranged for the Latin services of Catholic Mary or the English ones of Protestant Elizabeth. In 1560 appeared Day's Services, with the famous responses by Tallis and others, used to this day, the quaint title of which renowned collection is "Certain Notes, set forth in foure and in three partes, to be sung at the Morning, Communion, and Evening Prayer, and unto them be added divers godly psalmes and psalmes in the like forme." In 1559 Elizabeth, by special royal order, permitted "a hymn or such like song (our anthem) to be sung to the praise of Almighty God in the best melody and music that may be devised," in addition to the "modest and distinct song" which she enjoined for the general service, "that the same might be understood as if it were read without singing." The result was the gradual growth of the mass of fine and characteristic anthems which are, excepting our early madrigals, almost the only distinctively English contribution to music. [See **ANTHYM**.] At the present time in cathedrals the whole service is sung, the psalms and responses being harmonized, and the canticles elaborate musical compositions—the lessons alone are read. The anthem is sometimes of considerable length, and large selections from oratorios, &c., are used in this guise on great festivals; or an entire work, as the "Matthew-Passion," of Bach, &c., with orchestral accompaniment, is occasionally given, certain marked occasions being thus distinguished. It is not unusual for a cathedral anthem to be in three or more movements, and to take ten minutes in performance. There is now a growing tendency to enrich and enlarge the music of the communion service in many cathedrals,

till it almost approaches the Roman Catholic mass in its elaborate setting. This was unknown before 1840. The Nicene creed is now almost universally treated musically at great length (like the Latin *Credo*), and the *Sanctus*, *Benedictus*, &c., have their English counterparts. Probably at no time was the cathedral service, musically speaking, so rich and ornate as it is at present. Most "high" churches adopt the cathedral style of service also.

CATHELINEAU, JACQUES, commander-in-chief of the army of La Vendée, and one of the noblest specimens of a peasant soldier the world has ever seen, was born at Pin in 1759. He was a man of great intelligence and piety, and was held in such high estimation in the district that he was called the "Saint of Anjou." As soon as Jacques heard of the breaking out of the Royalist insurrection in La Vendée in 1793, he resolved on leaving his wife and family and putting himself at its head. With a small band of trusty followers he attacked and captured the Chateau of Jallais, garrisoned by 150 soldiers, and thus obtained a supply of arms and ammunition. Two other peasant leaders, Stofflet and Forêt, and also large numbers of peasantry, soon joined him, and succeeded in defeating the Republicans in several desperate conflicts. After the victory of Saumur, Cathelineau was unanimously elected commander-in-chief by the other leaders. But the noble peasant commander did not long discharge the arduous duties of his office. On the 29th of June he was mortally wounded in heading a desperate attack upon the town of Nantes, and died in a few hours.

CATHOLIC EMANCIPATION ACT. An act passed in 1829 to relieve Roman Catholics in the United Kingdom of many political disabilities under which they laboured, the chief being their exclusion from Parliament. A measure of the kind was promised to the Irish by Mr. Pitt, in order to induce them to consent to the Act of Union with Great Britain, in 1800; but he was unable to carry out his wish on the matter, in consequence of the obstinacy of the king, George III. In 1824, however, a Relief Bill was introduced into the House of Commons by Sir Francis Burdett, and carried by a majority of 268 to 241, but was thrown out in the Lords. A reaction then set in, especially amongst the ignorant; and the "No-popery" cry was raised to such an extent that in the following year the same bill was thrown out in the Commons by a majority of four. In 1828 it was, however, again carried by a majority of six; and Mr. O'Connell having been elected for the county of Clare, notwithstanding the oaths which prevented him from taking his seat, and the feeling on the subject in Ireland having become most intense, the Duke of Wellington, as prime minister, was compelled to yield rather than cause a civil war, which he felt convinced must ensue if the concession was longer delayed. Accordingly Mr. Peel, as leader of the government in the House of Commons, brought forward the Emancipation Act on 5th March, 1829; and the majority to go into committee on it was no less than 188 in a House of 508 members. Not one of the amendments proposed to be inserted in it was successful, and the third reading was carried by a majority of 172 in a House of 462. In the Lords the majority was 106—although nine months before they had refused by a majority of forty-five even to entertain the question—and the Act received the royal assent on the 13th of April.

This Act provided for substituting for the oath of supremacy one of general allegiance, by which all Catholic members of Parliament bound themselves to support the existing institutions of the state and not to injure those of the church, and admitted Catholics to all corporate offices and to an equal enjoyment with Protestants of all municipal rights.

CAT'LINE. Lucius Sergius Catilina was born, about B.C. 109, of a Roman patrician family which had sunk

into poverty. Catiline was *quæstor* about B.C. 77, and afterwards served as *legate* to Scribonius Curio, *proconsul* of Macedonia, B.C. 75. He was *prætor* in B.C. 67. At the expiration of his *prætorship* he obtained the province of Africa. He was an unsuccessful candidate for the *consulship* in B.C. 66, and in B.C. 65 it is said that he engaged in a plot to murder the *consuls* Cotta and Torquatus; but the scheme failed owing to the impatience of Catiline. In this same year he was tried for malversation in the government of his province; but he secured an acquittal, as it is stated, by bribing the judges. In B.C. 64 he was a candidate for the *consulship* against Cicero for the year B.C. 63. During the contest he was tried with many others for murders committed during the proscription of Sulla, to whose party Catiline belonged, and especially for that of Marius Gratidianus, uncle to Cicero; but he was again acquitted. These and other crimes were brought against Catiline by Cicero, whose authority has given the accusations weight for all these ages. But the candid inquirer asks with Professor Beesly ("Catiline," &c., London, 1878), how it is that such a villain, murderer, violator of vestal virgins, and worse, should have associated with all the best men in Rome, and when accused of malversation should have had his defence prepared by Cicero himself, as we know from his letters to Atticus, i. 2.

In the beginning of June, B.C. 64, about a month before the *consular* election, Catiline held a meeting of his party, eleven men of senatorian rank and four of equestrian being present. As far as can be gathered Catiline was now the leader of the party of reform, which Cicero, who had coquetted with it at first, now definitely left for the senatorial or aristocratic party. Catiline lost his election, and pushed forward his designs with great vigour for the next year, B.C. 63, when the *consular* elections passed off quietly, and Catiline was again rejected. Money and arms were collected; and Manlius, one of Sulla's veterans, only waited Catiline's orders to take the field with a large body of his comrades, who, after Sulla's victories, had been settled in different parts of Italy. Information of their proceedings was conveyed to Cicero, and by him communicated to the senate, who, on the 21st October, B.C. 63, issued the decree in the usual form, which gave dictatorial power to the *consuls*. Catiline still kept up the appearance of innocence, and came down to the senate, which was assembled by Cicero on the 8th November. It was on this occasion that Cicero broke out into the celebrated invective, which is the beginning of the first speech against Catiline. Catiline began to defend himself, but was interrupted by the senate calling out that "he was an enemy and a traitor to his country." Catiline saw that death or revolution must be chosen, and chose the latter. His letter to Catulus, whom he asked to protect his wife and children in his absence, is a dignified production, in vivid contrast to the passion of Cicero. Rome was rotten to the core; Catiline says he has endeavoured to reform the state within the lines of the constitution, but unworthy men have crushed his efforts. His conscience is clear, and more vigorous efforts must be made. (See this remarkable letter in the Emperor Napoleon III.'s "Cæsar.") Catiline left the senate-house, and set out for the camp of Manlius. The senate immediately declared him and Manlius enemies to the state, and ordered the *consuls* to raise troops.

A high reward which had been offered by the senate for information respecting the alleged plot had produced no evidence, and it appears certain that a large proportion of the population approved of Catiline's design. The senate certainly did not appeal to the people for support. Weeks passed without Catiline forcing a contest, and Manlius presented a petition of grievances to the senate; it is quite evident Catiline was reluctant to begin a civil war. An unsuccessful attempt to draw into the revolt the ambassadors of the Allobroges, at that time in Rome, furnished

the *consul* with evidence against the principal conspirators. Lentulus, Gabinius, Statilius, and Cethegus, who still remained in Rome, were arrested; and after a long debate in the senate on the 5th December, in which Cæsar argued against and Cato in favour of the capital punishment of the conspirators, they were condemned to death without a trial, and quite illegally strangled. Catiline now found himself hemmed in by Metellus Celer on the side of Cisalpine Gaul, and by Petreius with a superior force among the Apennines. He made a furious attack on the troops of Petreius, was defeated, and fell after a desperate resistance, January, B.C. 62.

Again, it is well worthy of note, and comes from the testimony of the hostile Sallust, that "all were wounded in front, not a man was taken alive; Catiline himself gasped out his life rigged round with the corpses of his foemen." These are not the ways of debauchees, criminals, and traitors. And when men came to continue to suffer from the grinding tyranny of the aristocrats, they naturally turned upon the unscrupulous accuser, the *consul* who was the first to break the law, beginning by filling the voting places with soldiers to prevent Catiline's election, &c.; and Cicero was a hated and despised man from that time forth. His whole life was a cry of disappointment at the neglect he experienced of those *consular* services he esteemed so glorious. Catiline has been gibbeted for eighteen centuries by the unequalled philippics of his foe; but without this desperate and ill-fated revolt by a bankrupt fiery soldier, it is probable that the great Cæsar's leading of the popular party to victory would not have been so easy to accomplish. The aristocrats had been compelled to show their hand, the people had felt their strength. Finally, the debate in the senate on 5th December, 63, was the first formal espousal of the popular cause by Cæsar. He argued strongly against the violent conduct of Catiline, but he warned the senators of combating violence with illegality, and condemning these accused men without trial was a judicial crime. The official accuser withdrew his accusation, senator after senator went with Cæsar, till a majority had been obtained. Cato alone had force enough to bring back the aristocrats to their old policy, and to threaten Cæsar till he was compelled to withdraw from the senate-house.

CAT'KIN, in botany, is a kind of inflorescence which differs from the spike in bearing uni-sexual flowers, falling off the stem by an articulation, after its temporary office as the support of the organs of reproduction is accomplished.

CATO (i.e. the Wise) was a surname given to Marcus Porcius Cæcilius, commonly called *Cato the Censor*. He was born in B.C. 234, of a respectable family in Tuscany, and passed his earlier years on a farm in the Sabine country. He served under Fabius at the capture of Tarentum in 209, and two years after he distinguished himself at the battle on the banks of the Metaurus, which was fatal to Hasdrubal, the brother of Hannibal. In private life he maintained the same character for hardness, industry, and sobriety which he had earned in the military profession. He was persuaded to remove to Rome, and to offer himself for office. Cato was *quæstor* in 204 B.C., and was appointed to join the army in Sicily, which Scipio was about to carry across into Africa; but the profuse expenditure of the general offended Cato's notions of strict economy. The *quæstor* returned to Rome, and taking his seat in the senate, to which he was entitled by right of his office, he denounced the conduct of Scipio as fatal to the discipline of the army. But with all his rustic character, Cato was a friend to literature, and it was he who first brought Ennius, the Calabrian poet, to Rome. After holding the plebeian *ædileship* and the *prætorship*, in the latter of which he was the governor of Sardinia, he was elected *consul* in B.C. 195, the year of Terence's birth. Cato very successfully governed his province, Nearer Spain.

When Antiochus invaded Greece, Cato served in the Peloponnesus; and in 191, by a bold movement, he dislodged Antiochus from the pass of Thermopylae, and had the chief glory of the victory gained there by M. Atilius Glabrio. In 184, the year in which Plantus died, he was elected censor. This censorship he made memorable by the strictness with which he executed its important duties. He was now fifty years of age, and he continued for more than thirty years to take a prominent part in public affairs. His death, at the age of eighty-five, happened in B.C. 149.

Cato was a soldier, a politician, an orator, an agriculturist, and an historian. One hundred and fifty of his orations were preserved and admired for many ages (best edition, Gesner, Leipzig, 1774). "*De Re Rustica*," on agriculture, if it be rightly attributed to Cato, is certainly not in the form in which he wrote it. Of his historical work, entitled "*Origines*," a few fragments remain. In his old age Cato diligently studied Greek, then the literary language. But his hostility to anything calculated to injure the stern simplicity of Roman manners, which already threatened to disappear, was inveterate. See, for instance, the article *CARNIADIS*. It was Cato who, at eighty-four years of age, caused the destruction of Carthage, then beginning to recover from the second Punic War. He had observed her prosperity when sent thither on an embassy, and thenceforth ended every speech, no matter on what subject, with *Delenda est Carthago* (Carthage must fall).

Cato the Censor was the great grandfather of Cato Uticensis. The character of Cato is boldly drawn by Livy (xxxix. 40).

CATO, MARCUS PORCIUS, who was surnamed *Uticensis* (of Utica) from the place of his death, was the great-grandson of Cato the Censor, and born B.C. 95. The character of his mind naturally led him to embrace the philosophy of the Stoics, and he became a pupil of Antipater the Stoic. Inflexible decision, severity, and harshness appear to have been the prominent features of his mind; and the great privations and hardships to which he frequently subjected himself, such as abstaining from food and making long journeys bareheaded and in all weathers, were calculated to strengthen these peculiarities. When his half-brother Cæpio died, he is said to have relaxed the sternness of his spirit, and he who rarely laughed was then seen to weep.

Cato's military career commenced with serving as a volunteer in the war against Spartacus, B.C. 73. He afterwards went as a legionary tribune to Macedonia, where he was a model of sobriety and courage. The designs of Metellus subsequently induced him to become a candidate for the office of tribune of the people. He was successful in his application, and gained by his conduct general esteem. Cato took part with Cicero against Catiline, B.C. 63, procured the execution of the Catilinarian leaders by a fiery harangue in the narrowest oligarchical spirit, and first gave Cicero the title of *Pater Patriæ* (Father of his Country). He vehemently opposed the union of Pompey, Crassus, and Cæsar, and though threatened with banishment fearlessly spoke against Cæsar's agrarian law, B.C. 59. He was sent to Cyprus and Byzantium on a special mission; and on his return he was elected prætor, in which office he endeavoured, as far as possible, to put a stop to bribery and corruption. He vainly sought to bring about a reconciliation between Cæsar and Pompey, and failing in this he sided with the latter, B.C. 49. He was not in the battle of Pharsalia, B.C. 48, but was stationed at Dyrrachium, whence he went over to Africa after the battle. Scipio, in command of the troops of the aristocratic party, was defeated by Cæsar in the battle of Thapsus, B.C. 46; and Cato, who was in Utica, encouraged his countrymen to stand a siege, but the approach of Cæsar alarmed them. Upon this, Cato advised his friends to save themselves by flight, and he even accompanied them to the

port. After an evening's meal, and a spirited conversation with some friends, he withdrew to his chamber, and, after embracing his son with unusual affection, he lay down and read Plato's "*Phædo*," on the immortality of the soul. He stabbed himself below the breast, and died the same night, B.C. 46, in the forty-ninth year of his age. Cicero's contemporary panegyric of "Cato" gave rise to Cæsar's conclusive "*Anticato*." The production of Addison's famous tragedy of "Cato" was the chief dramatic event of Queen Anne's reign; and the soliloquy beginning "Plato, thou reasonest well," is probably as often recited as any passage in the language, excluding Shakespeare.

CATO STREET CONSPIRACY, so called in consequence of the meetings of a gang of desperate men, under one Arthur Thistlewood, and who were sworn to assassinate the ministers of the crown, having taken place at Cato Street, Edgeware Road. They intended to carry out their designs at a cabinet dinner at which all the ministers were to be present; but the plot was divulged by one of their own number, and all the leaders were taken and executed as traitors, 1st May, 1820.

CATRINE, CATERAN, or KATRINE, a lake in the county of Perth, 10 miles W. of Callander, and 5 E. of Lochlomond. It is 10 miles long and about 2 broad, with a depth of 740 feet. It discharges E., through the celebrated pass of the Trossachs, into Loch Achray. The surrounding mountains, of which Benvenue is the highest, present the most rugged and picturesque forms, and abound with wood. The scenery of the E. end of the lake is of the most exquisite beauty. The water-supply of Glasgow is drawn mainly from this lake. The water is carried in pipes and by tunnels to Mugdock reservoir, near Milngavie, whence it is distributed to the city and suburbs. The works were opened in 1859.

CATRINE, a small town in the county of Ayr, Scotland, situated 2½ miles S.S.E. of Mauchline. In it the extensive cotton factories of James Finlay & Co., of Glasgow, are situated. The gigantic water-wheel is an object of interest to strangers, while the clean and substantial dwellings of the workpeople, and the friendly societies and library, tell of a respectable proprietary and well-to-do operatives. Population, 2638. The sonnet of Burns commencing

"The Catrine woods were yellow seen,
The flowers decayed on Catrine lee,"

refers to this place.

CAT'S-EYE is a translucent greenish-gray variety of chalcidonic quartz, in which penetrating thin fibres of Asbestos produce the peculiar opalescent lustre from which it has procured its name. Specimens are seldom procured larger than a hazel-nut, but it is a gem of considerable value, good cat's-eyes being worth from £100 to £300. The best are obtained from Ceylon and India, but they also occur in Bohemia, Bavaria, and in the Hartz and Ural Mountains. A green variety has been found near Llanbair, Wales, and also in Scotland.

CAT'S KILL MOUNTAINS, a mountain group of the Alleghenies, in the S. part of the state of New York, of which the highest point is Round Top, 3810 feet. Pine Orchard, with its "mountain house," at the height of 2212 feet, is a favourite resort among these mountains, the scenery of which is, perhaps, the most picturesque in the whole of the United States.

CAT'S-TAIL GRASS. See *PHILEUM*.

CATTARO, a seaport in the province of Dalmatia, Austria, and the capital of a circle of the same name, is situated 36 miles S.E. of Ragusa. The Gulf of Cattaro, at the head of which Cattaro is situated, is a most beautiful and picturesque inlet, about 30 miles in length and 1½ mile wide at the entrance, with a depth of from 15 to 20 fathoms. It opens into a harbour which has two rocks at its entrance, dividing it into three narrow channels, two of

which will admit the largest vessels. It thus forms one of the finest harbours in the Adriatic. The town stands at the S. extremity of the inner basin. It is surrounded by mountains, and by means of their height it has been easily and strongly fortified. The population is 3000. Owing to the loftiness of these mountains, Cattaro has this disadvantage, that the sun rises an hour later, and is lost an hour earlier, than in other places under the same latitude. The district of Cattaro was the seat of the Roman colony of *Aserivium*, but the town itself only dates from the sixth century. It formed at one time, an independent republic, which in 1420 placed itself under the protection of Venice, and together with it was handed over to Austria in 1797—an arrangement resisted with great vigour, but vainly, by its brave people. It passed afterwards in secession into the hands of the French, Russians, and English. At the congress of Vienna it was restored to Austria.

CAT'TEGAT or **KAT'TEGAT**, an inlet of the North Sea, lying between Sweden and Jutland, about 150 miles long and 40 miles wide at the N. end (opposite the Skaw Light), and 100 miles wide in the S. part, south of the Island of Anholt. Its depth is very unequal, and it has numerous dangerous sandbanks and currents. The Skagerrack connects it with the German Ocean. The Danish shore is low, but that of Sweden is bold and precipitous. It contains the considerable islands of Lessöe, Anholt, and Samsöe, and the islets Trindelen, Silderön, Hesselöe, &c.

CATTLE. In its most extensive sense, the word *cattle* denotes all the larger domestic quadrupeds which are used for draught or food. It is, however, applied restrictively to the domesticated varieties of the genus *Bos*. The rearing and feeding of cattle is an important branch of agricultural industry; and much of the success of a farmer depends on the judicious management of live stock, without which his land cannot be maintained in a proper state of fertility. Different breeds, moreover, are suited to different purposes; and the feeder and the dairy-farmer, in the choice of their stock, consult their respective interests. For an account of the different breeds of cattle see *Ox*.

With respect to the breeds to be preferred, every farmer must judge for himself, taking the extent of his land, its quality, its produce, and also his ultimate views into consideration. Different properties are required by the feeder and by the dairy-farmer; and yet, to a certain degree, these different properties may be found united, not indeed manifesting themselves at the same time, but in due succession. Thus the milch cow of the Durham breed, profitable while in milk, will be equally so as a dried beast, fattening for the butcher.

• Till recently farmers in England have too much neglected the manure of their stalled cattle, and especially the liquid manure; all this should be collected in tanks. Its value cannot be too much impressed upon the mind of the agriculturist; it will quite repay him for his outlay in making the necessary reservoirs.

According to the agricultural statistics published in 1885, the number of cattle in the United Kingdom in that year was:—

England,	1,150,000
Wales,	680,000
Scotland,	1,140,000
In land,	4,130,000

Total, 10,400,000

In 1884 there were 309,696 cattle imported—which was about the average supply—chiefly from Denmark, Hamburg, Holland, and Belgium.

CATULLUS, CATVS VALERIUS, was born at Verona, B.C. 87, about seventeen years before Virgil. His father was a friend of Cæsar. Catullus left home at an

early age for Rome, where he plunged into extravagance, mortgaged his estate, and fell into poverty. He endeavoured to recoup himself by joining Memmius in his Bithynian expedition. Notwithstanding his poverty he lived in intimacy with all the men of talent of his day—Cicero, Cornelius Nepos, Licinius Calvus the orator, Asinius Pollio, and the rest. He died B.C. 47.

A considerable part of the writings of Catullus is supposed to be lost. The testimony of all the men of wit and learning pays tribute to his brilliant imagination and the polished elegance of his language. His style is easy and unaffected; his lines are full of sweetness and harmony. In his playful moods he has many touches of humour, and when pathetic his feelings are natural and unrestrained. His longest poem is the heroic "Epithalamium of Peleus and Thetis." The best edition of Catullus is that of R. Ellis (Oxford, 1868), and the best translation is by the same scholar (1871).

CAUBUL. See *AFGHANISTAN, BALUCHISTAN.*

CAUCA'SIA, a division of Russia, including the territory between the Black Sea and the Caspian, the Manytch and the Aras. It is divided into Ciscaucasia in Europe and Transcaucasia in Asia. Ciscaucasia is subdivided into the government of Stavropol, the districts of Kuban, Terek, and Daghestan; Transcaucasia into the governments of Tiflis, Baku, Elisabethpol, Erivan, and Kutai, and the circles of Sukhum, Zykatal, and the Black Sea, or Chernomorsk. The area is 172,837 square miles, and the population 5,000,000.

CAUCASUS is an extensive mountain system between the Black Sea and the Caspian Sea. The general direction of the range is from W.N.W. to E.S.E. It begins on the shores of the Black Sea, near the small town Anapa, at about 14° 10' N. lat., and 37° 10' E. lon., and terminates on the shores of the Caspian Sea at 10° 30' N. lat., and 50° 20' E. lon. The length is about 700 miles; the breadth varies from 60 to 120. The range was formerly included in Asia, but it now forms part of the boundary line between this continent and Europe. The central part of the range, which contains the loftiest peaks, is formed of parallel chains joined by elevated plateaux, through which run narrow ravines of great depth. The loftiest summit, Elburz or Elborus, was ascended for the first time in 1868 by three Englishmen, who found its height to be 18,526 feet. West of Elburz the mountains are of comparatively low elevation, but east of that point several summits rise above the snow-line. Many of the off-shoots approach close to the Black Sea, and give the coast a bold and rugged character. The approach to the Caspian shores is not so close. The Caucasus is entirely unconnected with any of the great mountain systems of Europe or Asia, except by a range of hills known as the Sumat Mountains, which form a link with the great Armenian group of mountains. To some of these ranges to the south of the true Caucasus, the name of Little Caucasus has been given, but the term Caucasus should properly be confined, as it has been from the time of the Greeks, to the great barrier of mountains reaching from the shores of the Black Sea to those of the Caspian. This forms a range so narrow that the same summits can be seen from the Black Sea and the low Mingrelian Hills on one side, and from the steppes of the Terek and the Kuban on the other. Owing to this peculiar conformation of the chain, maintaining as it does a high average elevation for long distances, there are, as in the Pyrenees, no lakes and no great longitudinal valleys, like those of the Rhone, Rhine, Inn, and Drave.

Among the snow-clad summits, as in the Alps, glaciers are common, giving rise to many rivers, of which the chief are—on the N., the Terek, issuing from a small glacier at the base of Zilga Khokh, and discharging into the Caspian Sea; the Kuban, rising at the base of Mount Elburz, and discharging by two mouths into the Black Sea and the Sea

of Azoff; and on the S., the Rion, rising at the base of the mountain called Pasimta, and discharging into the Black Sea; it is the ancient *Phasis*, so famed through the legend of the Argonauts. The Kur, though it receives many alluents from the Caucasus, has its actual source in the mountains of Armenia.

In mineral riches the Caucasus is probably superior to the Alps. Traces of gold and copper are common; but hitherto these metals have not been worked, except that a small quantity of gold is washed from the sand of some rivers. Iron abounds in many places, and is worked by the natives in a rude way. There are no active volcanoes in the Caucasus, but traces of volcanic agency occur. Earthquakes also happen sometimes. Naphtha or petroleum occurs abundantly, especially in Absheron. [See BAKU.] Mud volcanoes, hot and sulphuric springs, and salt lakes are also met with.

There is probably no region on the globe of so small an extent which contains such a number of different nations as the valleys of the Caucasus. The chief tribes are the Georgians, Imertians, Mingrelians, Gurians, Samians, Abkhasians, Kabardians, Tchetchenes, and Lezghians. There are also German colonists, who, removed from Wurtemberg in 1812-15, are settled in various districts, and number above 5000; they have greatly improved the culture of the vine. The early subjection of Georgia, Imeritia, and Mingrelia by Russia, and the opening of a road into the very heart of the Caucasus, did not fail to arouse the natives. Violent commotions were soon excited, and the mountaineers took part in every coalition formed against the common enemy. It was not, however, till Russia was relieved from all her quarrels with Persia and Turkey, about fifty years ago, and had been confirmed in her hold of Anapa and Su-juk-kalah by the treaty of Adrianople, that she directed all her efforts against the western mountaineers, and began that war which ultimately ended in their subjugation and in the emigration of some of the most warlike tribes to Turkey, in the face of very great hardships. Although Russia obtained the whole of Georgia by the treaty of 1813, it was only in 1828 that she acquired the additional provinces of Naktschivan and Erivan, with the fortresses of Utsighur, Akhalziche, and Akhi-Kuaki, and also the important fortresses of Anapa and Poti, and was thus enabled to establish a firm footing on the whole of the eastern coast of the Black Sea, from the Kuban to Fort St. Nicholas. On the Caspian side of the Caucasus the same system of military control has been gained. From the fortress of St. Ekaterinograd, which commands the northern fort of the Pass of Darial, a road has been carried by Mozdok and St. Naour to Turki, on the Caspian, and thence by Derband and Kuba to Baku, which unites the Caspian with the Euxine, south of the Caucasus. A junction is effected to the north from St. Ekaterinograd by Gheorghievsk or Gheorgie, Aleksandrof, Stravapki, and a whole line of forts along the Kuban to Tzontarikon, on the Strait of Kerch, between the Sea of Azoff and the Black Sea. The resistance which the Caucasian tribes, for more than half a century, offered to the arms of Russia attracted to them the attention of the world. That resistance was brought practically to an end by the capture of Selimyl in 1859, and now the whole region belongs to Russia. The so-called *Caucasian races* of mankind, which include most of the inhabitants of Europe and the Persians and Hindus of Asia, were believed by those ethnologists by whom the name was given to them to have their origin in this region.

CAUCUS, a term used in the United States to describe a political organization which exists there for the object of regulating and controlling all elections to office throughout the country. In every town or village each party, prior to an election, holds meetings for the purpose of nominating candidates to office, or appointing delegates to the conven-

tions. Those who attend these meetings are expected to vote for the persons thus nominated. A very similar system, to which the term caucus is often employed, has recently developed in England, and has been brought to great perfection in Birmingham. The word is said to be derived from the caulkers of Boston, who had a dispute with some British soldiers a short time before the Revolution. Several citizens were killed, and meetings were held at the caulkers' house, or *caulk-house*, to concert measures for obtaining redress.

CAUDEBEC, a seaport town of France, in the department of Seine Inférieure, on the Seine, at the mouth of the Caudébec, 6 miles S. of Yvetot. It is a most pretty and picturesque little town, and was formerly the capital of Pays de Caux. The parish church, built in the fifteenth century, is remarkable for the boldness and delicacy of its architecture. Previous to the revocation of the edict of Nantes it was comparatively flourishing, but that disastrous measure gave a blow to its manufactures and commerce from which it has never recovered. In 1419 it held out against the English under Lord Talbot for six months. The population in 1883 was 2200.

CAUDINE FORKS, THE, is the name of a defile near Caudium, a town in Samnium between Capua and Beneventum, where the entire Roman army was taken prisoners in the second Samnite War, 321 B.C., much as the entire French army was captured by the Germans at Sedan in 1870. Caius Pontius, the Samnite general, allowed the careless consuls Veturius and Postumius to lead their army through the Caudine Forks into the small plain beyond, surrounded with steep mountainous hills. Finding him in force at the far end of the valley the Romans attempted to return, but the Samnites had meanwhile seized the defile by which the Romans had entered. Hemmed in front and rear by their foes, and on each side by precipitous cliffs, the legionaries fought till half the officers had fallen, and then the consuls submitted. Pontius offered to let the army go free if they would lay down their arms, pass under the yoke as an acknowledgment of defeat, and engage to procure Samnium an honourable peace with her great enemy. His terms were taken. The soldiers laid aside arms, armour, and cloaks; the Samnites set up the "yoke," of two spears with a third tied across them at top, and the whole Roman army passed beneath. The consuls and all the officers signed a treaty honourable to both nations, and the whole army returned to Rome, except 600 hostages. Rome went into public mourning, and the consuls themselves were the first to declare that the treaty should be repudiated. Those who had signed it were restored to the Samnites in chains; but Pontius justly complained that giving up a few officers did not place the army in the Caudine Forks as it was when the treaty was signed, and he contemptuously returned the prisoners. The magnanimity of the Samnites throughout is in striking contrast with the shameless treachery of Rome.

The position of the Caudine Forks is not quite fixed. But Livy's description, repeated above, quite destroys the claim of the Valley of Arpaia, near Cancelli, to represent it; the neighbouring defile between S. Agata de' Goti and Mojano, near Dugenta, on the Benevento Railway, seems rather to be the scene of the famous disaster so accurately described. Both places are about 30 miles from Naples.

CAULER'PA, a sea-weed, which consists of a single cell, and yet may be of considerable size, the walls of the cell branching out and putting on the appearance of having roots, creeping stem, and fronds. There are several species of different forms, all natives of warm climates. They form the principal food of turtles.

CAULIFLOWER, a kind of esculent vegetable, consisting of the fleshy, young, undeveloped inflorescence of a variety of *Brassica oleracea*, and is hardly different from broccoli, except in being whiter and less hardy. It is said to have been imported from Cyprus in the sixteenth century.

CAUSATION signifies, etymologically, the *action* of a cause in producing an effect. The subject of causation has always been one on which the most subtle thinkers have exerted their powers of analysis; but, as in every similar research after final principles which cannot by any effort of the understanding be clearly discerned and defined, opinions remain still as conflicting as when the inquiry first began. Aristotle divides causation into material, formal, efficient, and final; and instances a physician curing himself as an example of all four at once, since (1) medicine is used, (2) according to prescription, (3) by the physician, (4) with the motive or final cause of his own restoration to health. In curing another person the final cause would be the necessity of food, &c., urging the physician to gain money, or the benevolence, sense of duty, &c., which actuated him. It appears to be agreed that, though in every instance we actually *perceive* nothing more than that the event, change, or phenomenon B always follows the event, change, or phenomenon A, yet that we naturally incline to *believe* in the existence of some unknown *quality* or *circumstance* belonging to the antecedent A, in virtue of which the consequent B always has been, is, and will be produced. Many philosophers, among them Sir W. Hamilton, have considered this belief intuitive; but the greatest thinkers, from Aristotle to Herbert Spencer, have considered it a matter of experience acquired or inherited. Mill's statement in the third book of his "Logic," chap. 5, is perhaps the clearest we have of the undoubted fact known by experience, that "every consequent is connected, in the manner now described, with some particular antecedent or set of antecedents. Some imperceptible bond of union may exist between antecedent and consequent—that is, causation may be something more than invariable succession; but if it exists we are unable to conceive it, if it does not exist we are unable to prove its non-existence." The fact of magnetic attraction is usually adduced in illustration of causative influence; and the inquiry, *why* does the magnet move the iron? suggests the idea of that quality which is denoted by the word *power*, about the nature of which metaphysicians have always disagreed, and their dispute remains still unsettled. It is this attributed *efficiency* in the uniform antecedent of a change which philosophers have considered as forming the *relation of cause and effect*; and their endeavour to express the conception of this hypothetical quality has occasioned the employment of a great variety of terms, as energy, faculty, influence, capacity, ability, virtue, force, possibility, fitness, aptitude, &c. The tendency to accept the known fact and disregard the improbable and valueless hypothesis grows greater among philosophers year by year.

• **CAUSE**, in natural philosophy. We have here only to explain the manner in which this word is used, and not to enter into any speculation upon the connection of cause and effect. In common language we say that A is the cause of B, when we have observed that B never appears without A having preceded it, or that A is always followed by B. Of course, A and B are to be taken, not as one phenomenon, but as the whole body of phenomena, antecedent in the one case and consequent in the other. In natural philosophy the word *cause* is used in two senses, which may be distinguished into true and hypothetical; and it is found convenient for distinction to Latinize the former term into *vera causa*. By a *vera causa*, or true cause, is meant the word cause used in the ordinary sense, namely, that which is actually concerned in producing the effect. Thus, the rotation of the earth is a *vera causa* in the production of day and night.

There are two different ways in which the word cause is used in the sense which we distinguish by the word *hypothetical*. The first is when we are able to prove that phenomena take place exactly in the manner and to the extent which would necessarily be if a certain supposition were

true. For example, when it is found that the motions of all the planets are precisely such as would take place if the sun attracted them all and they each other, as implied in the word gravitation, then the attraction which is sufficient to produce the effects in question is assumed as a hypothetical cause. Thus, in the old disputes about the motion of the earth, as to whether the earth moved round the sun or *vice versa*, each side admitted that the other produced an unobjectionable hypothetical cause; and the point in question was, which had the *vera causa*. And the doctrine of immaterialism [see BERKELEY] is an attack upon the notion of *matter* as a *vera causa* for the phenomena of the external world, though as a hypothetical cause it is admitted as an unobjectionable mode of speaking.

Secondly, a phenomenon is cited as the hypothetical cause of another when the two are always found together, and the nature and quantity of the second are connected by an invariable law with the nature and quantity of the first. Thus, in the phenomena of capillary attraction, because convexity and depression always go together, and also concavity and elevation, the depression is referred to convexity, and the elevation to concavity, by the same sort of language as would be used if the first of each couple were the *vera causa* of the second. This is a language of convenience, but is apt to be misinterpreted.

Questions as to whether hypothetical causes are true or not do not now occupy the attention of philosophers to the extent which was formerly the case. When motions are observed in any system, the forces which would be sufficient to produce them are at once substituted as hypothetical causes. Thus, though it be convenient to trace magnetism and electricity to some common hypothesis, few, we imagine, would attempt to find the *cause* of magnetism in the sense of the *vera causa*. It is otherwise when a hypothetical cause is found not to be sufficient to produce all observed effects. For example, the *undulatory* theory of light has prevailed over the *emanatory*, not because we have less reason to suppose that light is an emanation of particles from the sun and stars than existed 100 years ago, but because it is found that many lately discovered facts are *not* such as would be true if light were an emanation, but *are* such as would be true if it consisted in undulations excited in an elastic medium.

The great use of hypothetical causes lies in this, that they tell us, as long as they last, what to look for. The cause being assumed, the application of mathematics points out the time or circumstances under which to look for new phenomena, or at old ones in a new method. Thus several phenomena with regard to light which might have remained long unobserved, have been predicted by computation from the undulatory theory and subsequently verified. And in the planetary system several motions too small to be easily detected, except by a person who previously knows in what manner and at what time to watch for them, have been added by theory alone to the list, and verified by observation.

CAUSTIC CURVES. See CATACASTICS.

CAUVERY (Kaveri, the *Kāvēry* of the Greek geographer Ptolemy), a great river of Southern India, famous alike for its traditional sanctity, its picturesque scenery, and its utility for irrigation. Rising in Kurg, high up amid the western Ghats, in 12° 25' N. lat., and 75° 34' E. lon., it flows with a generally south-easterly direction across the plateau of Mysore, and finally pours itself into the Bay of Bengal, through two principal mouths in the Madras district of Tanjore. Its total length is about 475 miles, and the estimated area of its drainage basin 28,000 square miles. It is known to devout Hindus as Dakshini Ganga, or the Ganges of the South, and the whole of its course is holy ground. According to the legend, preserved in the Agneya and Skanda Puranas, there was once born upon earth a girl named Vishnumaya, or Sopamudra, the daughter of Brahma; but her divine father permitted

her to be regarded as the child of a mortal, called Kaveramuni. In order to obtain beatitude for her adoptive father, she resolved to become a river, whose waters should purify from all sin. Hence it is that even the holy Ganga resorts underground once in the year to the source of the Cauvery, to purge herself from the pollution contracted from the crowd of sinners who have bathed in her waters. At Tala Kaveri, where the river rises, and at Bhagamandala, where it receives its first tributary, stand ancient temples, annually frequented by crowds of pilgrims in the month of Tulamasa (October-November).

CAUX, a district of the former province of Normandy, which now forms the *arrondissement* of Havre, nearly the whole of those of Dieppe and Yvetot, and a part of that of Neufchâtel, in the department of SEINE-INFÉRIEURE.

CAVA or **LA CAVA**, a town of Italy, in the province of Salerno, 28 miles S.E. of Naples by railway. It has flourishing manufactures of silk, woollen, and cotton goods, and tobacco and pottery. It is the seat of a bishopric. The chief buildings are—the cathedral, a convent, and a Benedictine monastery, now dissolved. The monastery was founded in 1025 under the name of La Trinità della Cava, and was formerly very famous. The church contains the tombs of several anti-popes, but the monastery was most distinguished for its archives, containing more than 100,000 parchment and other manuscripts, including the "Codex Legum Longobardorum" of 1004. In the library also were some valuable specimens of early printing; a Latin Bible Vulgate of the seventh century, and a prayer-book with miniatures of the school of Fra Angelico da Fiesole. In 1883 the population was 21,500.

CAVALIER, in fortification, a defence work whose parapet is raised several feet above the ramparts of the fortress in which it is formed. It serves either to deblade those ramparts from the fire of an enemy on a neighbouring height, or to send a plunging fire into the trenches of the besiegers. It is generally constructed on the *terre-plein* of what is called a full bastion, which it resembles in form; and in this situation it may serve as a retrenchment. The ditches along its faces should be defended by traverses near the shoulders of the work.

Trench cavaliers are works raised by the besiegers on the glacis of a fortress, in order to enable them to direct a plunging fire of musketry into the covered way. They are filled with gabions placed in tiers above each other, and filled with earth.

CAVALLI, PIETRO FRANCESCO, a musical composer of considerable historical interest, was born near Venice in 1600. Cavalli was the name of his patron, and in the fashion of the time [see BOTTICELLI, &c.] the young musician adopted it out of compliment. His own name was Caletti Bruni. He sang under the famous Monteverde, and in 1640 became organist of St. Mark's, Venice, where he remained conducting the music till his death in 1676. But it is not his church music, though that is very fine of the period, which makes the interest of Cavalli. It is his improvement of opera (then newly founded by Monteverde among others), by the clearer division of the airs from the hitherto superabundant recitative; that is, the introduction of more forcible and piquant rhythm. Hullah ("Transition Period of Musical History," Lond. 1876) gives a very effective air of Cavalli's from the opera "Erismena" (1655). It is curious that the attempt of Wagner has been to undo the very work which Cavalli, about 250 years ago, so carefully and painfully accomplished, and to plunge the opera back into recitative, whence it originally emerged. Cavalli wrote his first opera in 1637, his last in 1669. Fétis gives the names of thirty-nine operas, but he is known to have written many more.

CAVALRY (remotely from the Latin *caballus*, a horse) is that class of troops which serve on horseback. Dragoons are a species of cavalry originally trained to act either

on horseback or on foot as may be required, but now are not different from other cavalry. They appear to have been introduced into the English service before the middle of the seventeenth century; but the oldest regiment of dragoons in the army is that of the Scots Greys, now called the 2nd Dragoons, which was raised in 1681. The name dragoon appears to come from the Latin *draconarius* the appellation given to a standard-bearer, who carried a standard or colour with the figure of a dragon on it (see Robert of Gloucester's Chronicle).

Hungars are a species of light cavalry, which originally constituted the national militia of Poland and Hungary. One man was chosen from every twenty villagers, *huszar* being "the twentieth" in Magyar. The Lancers were introduced into the British service in order to correspond to the corps of what were called Polish Lancers in the French army. The long lance carried by this class of troops was supposed to be of use in a charge against infantry.

In the year 1888-84 the whole strength of the cavalry in the British army was as follows:—Life and Horse Guards, 78 officers, 188 non-commissioned officers, 1029 rank and file; Cavalry of the line, 494 officers, 1084 non-commissioned officers, 8582 rank and file; total, 572 officers, 1272 non-commissioned officers, and 9611 men. The number in India was 216 officers, 396 non-commissioned officers, and 3672 rank and file. The cost of the Life and Horse Guards was £67,920, and of the cavalry of the line, £127,300—total, £195,220.

From the earliest dates at which there is any record of armed men being systematically trained and organized, cavalry has always formed an integral part of every army, although the relative size and importance of the arm has varied according to the nature of the country and the peculiarity of its inhabitants.

The influences of the progress of science upon the art of modern war have become the commonplaces of history. When breechloading weapons were first introduced on the Continent for sporting purposes, they were generally derided by Englishmen as vain and trumpery inventions. Who could then foresee that within a quarter of a century the breechloading long-range rifle would have revolutionized armies and necessitated a total change in military tactics? No branch of the service has felt these improvements more decidedly than the cavalry, or has been compelled to accommodate itself more quickly to the conditions of its altered rôle. For more than half a century the palmy days of cavalry had been gradually declining, and after the meeting of France and Austria on the plains of Lombardy the students of war openly declared that its use had passed away for ever in the face of its proved small arms and rifled cannon. Undoubtedly the cavalry on both sides in that short and sharp campaign had shown themselves singularly impassive. Yet when the Austrians met the Prussians in 1866 they did much to retrieve their lost laurels. No more splendid feat of arms has ever been performed than that which stemmed for a time the onward rush of the victorious Prussians at the close of the day of Königgrätz, and thus enabled the shattered and demoralized legions of Benedek to pass the Elbe and escape the disgrace of a surrender. But the brilliant conduct of the Austrian horsemen was lost sight of in the signal defeat of the Austrian nation, and the needle-gun seemed to have rung the last knell of that arm around which still hung some of the halo of ancient chivalry. Prussia immediately took the lead in military progress, which she has since successfully maintained. But, to the surprise of everyone, instead of making reductions in the cavalry branch of her army, she largely increased that arm of her military service, while at the same time she introduced a complete change in its system of use and action. When, in 1870, she swept on in one tide of unbroken success up to the very gates of Paris, no troops earned a more brilliant reputation

than the regenerated cavalry of the German army. Then it was that the horsemen of every power in Europe felt that a new era had dawned for them; and while some of the old school still lingered with regret over the simple but heroic action of the cavalry of ancient days, the young and energetic recognized the higher and nobler career before them as one that specially demanded and developed the exercise of individual gallantry, boldness, and enterprise.

What was the great change that had led to such splendid results as were achieved by the German horse? The military capacity of Von Moltke had recognized that in the rapid movements of modern armies early and trustworthy information must become of paramount importance. The old system of using large bodies of cavalry was made subservient to the employment of numberless small parties that, spreading like a fan far in advance of the gathering German hosts, screened all their movements and detected those of the enemy. The French were utterly wanting in the special instruction that made this system so valuable.

By this contest it was shown that the cavalry officer of the future, to be useful, must be no idle and showy loungeur in a garrison town, but a bold, active, and highly-instructed horseman, intimately acquainted with both the action and organization of all branches of the service, and ready to report upon their movements in the field. So much was this felt that even among the lower ranks all strove to imitate that intelligence for war and outpost work which has ever been a characteristic of the German trooper.

The drill of all the cavalry of Europe was remodelled, and simplicity and rapidity were substituted for the numerous, complicated, and useless formations of earlier days. Among the many theories that found warm advocates was one which had been tested on a large scale in the long and fratricidal war that only a few years before had devastated the American continent. Commencing war with untrained troops on both sides, the Americans had aimed at producing the old and discarded dragoon, or mounted rifleman, rather than that cavalry-man proper who required a high degree of previous training. But although the Germans had paid more attention than heretofore to occasional dismounted duties, the hybrid soldier found no favour with the brilliant leaders of the German horsemen. They laid greater stress than ever upon maintaining the prestige of cavalry, but decided that high training was absolutely necessary, and that the young mounted recruit should never be taken into the field. In order to carry out this theory, Germany maintained her cavalry at almost a war strength in time of peace; and most of the military powers, recognizing the value of the arrangement, quickly imitated her example. Russia determined to maintain both her cavalry and horse artillery upon nearly a war strength, so that these two arms, that must open the game of war, should leave nothing to create at the sudden commencement of hostilities. Russian military students began carefully to consider whether, in the new rôle that seemed to be dawning, the enormous hordes of Cossack horsemen which were at her disposal might not be turned to greater use than of old. They argued that these men, accustomed to independent action, and able to maintain both themselves and horses in countries where regular cavalry would starve, were just the sort of troops to be employed on these forward raids, while the numbers of such men at Russia's disposal would enable her to swarm round even the largest of modern armies, and thus to cut off the enemy's supplies and imperil his communications. These calculations were, however, far from realized in the war with Turkey in 1877, for the Cossacks then proved comparatively useless; and in consequence of the nature of the roads and other obstacles, the Russians were often unable to avail themselves of their other cavalry to the extent they anticipated. ("History of Cavalry," by Lieutenant-colonel G. T. Denison, London, 1877.)

In the military operations in Egypt in 1882 the British cavalry well sustained its fame for both marching and fighting power. For the first time since the days of Waterloo the Household Brigade went upon foreign service, and at Kassassin performed a series of brilliant charges strongly suggestive of their ancient exploits. Tel-el-Kehir was essentially an infantry battle, but immediately afterwards General Drury-Lowe and the cavalry under his command made a splendid march of more than 40 miles to Cairo, and by their timely arrival no doubt saved the European population there from a repetition of the fearful outrage and massacre that had been witnessed at Alexandria only a few weeks before.

CAVAN, an inland county of Ireland, in the province of Ulster, is bounded N. by Fermanagh, N.E. by Monaghan, S.E. by Meath, S.W. by Longford, and W. by Leitrim. Its greatest length, from north-west to south-east, is 51 miles; its greatest breadth, from north to south, is 28 miles. The area is 746 square miles, or 477,440 acres. The population in 1881 was 129,476, being a decrease of more than 120,000 in forty years.

The county is in form an irregular oval. It rises into mountains of considerable height at its north-western extremity, but more than two-thirds of its surface, although high and very irregular, presents no elevations of any consequence. Slieve Russell, the highest point of the north-western chain, forms, with the remainder of the Ballynagerragh Mountains, the southern boundary of the basin of Lough Erne, the chief feeders of which lake flow from this county. From Lough Gawnagh on the south, where Cavan joins the county of Longford, the river Erne flows northward, through Lough Oughter, to the borders of Fermanagh, where, after having nearly bisected the county of Cavan, it enters Upper Lough Erne at the same point with the Woodford, a considerable stream which also crosses the county a little further north from a small lake on the borders of Leitrim. The Erne, between Lough Oughter and Upper Lough Erne, receives the waters of the Annalee, which flows westward from two lakes on the borders of Monaghan. Lough Sheelin and Lough Ramor, or Virginia Water, are also two considerable lakes in this county. The Shannon is considered to take its rise in Cavan in a stream at the foot of the Cuilagh Mountain, known as the Shannon Pot, and the Blackwater rises near Bailieborough. There are several mineral springs, and the waters of Lough Leighs are noted for their antiscorbutic properties.

The geological formation of the county is schistose. A patch of granite of about 49 square miles occurs in the eastern part of it, and the schists occupy its greater portion. Limestone is found towards the south, where Cavan borders on the central limestone plain of Ireland, but the quantity is small. The whole county is rich in minerals. There are mines of coal and iron; and lead and silver ore, lead and copper ore, coarse manganese and ochres, occur in different parts of the county. Excellent marl, fullers' earth, potters' clay, and brick-clay, are abundant throughout the county.

The soil of Cavan is generally cold, spongy, and inclined to rushes, but with proper draining and manuring it can be rendered highly productive. In the district watered by the Erne and its feeders the crops are luxuriant, and the face of the country rich and pleasing. In the mountainous country, however, the reverse is the case, and agriculture is still very backward. There is little wheat grown in the county: potatoes, oats, and flax are the principal crops raised, and about a third of the entire area under cultivation is devoted to meadow and clover. The native breed of cattle is poor; but spirited resident proprietors have of late years introduced an improved stock, which has produced good results. Goats are raised very extensively. The linen trade, formerly carried on to a considerable extent in this county, has declined, but there are still many

bleach-grounds.* The county returns two members to Parliament.

The county in early times formed part of the territory of the tribe of the Eidini. Owing to the nature of the country the natives were long able to maintain the struggle for independence against the English; but in 1548 it was formed into a county of Ulster and divided into seven baronies, two of which were left in the possession of the sept of Mackennow and Macgauran, subject to their ancient customs. At one time the county was subdivided into polls, each poll consisting of 25 acres. The principal English and Scotch families settled in Cavan were the Auchmuties, Bailies, Butlers, Hamiltons, Lamberts, Parsons, and Ridgeways. In connection with the mountains and lakes there are, as might be expected among such picturesque scenery, numbers of superstitions and legends. The Quilla Mountain, in particular, as the place of inauguration of the Macguires, is held in veneration by the peasantry.

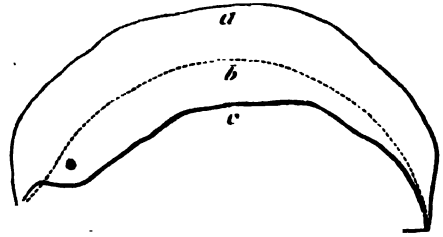
CAVAN, the chief town of the above county, is 85 miles from Dublin by the Midland Great Western Railway. It is situated in the centre of a rich tract of land, and watered by one of the streams which fall into Lough Oughter. It is an ancient but dirty place, with few good houses. It contains a very handsome county court-house, a county gaol and infirmary, a barracks, and a grammar school founded by Charles I. The church is a beautiful structure, and there are commodious Roman Catholic and other chapels, and a union workhouse. The town has a considerable retail trade. The population in 1881 was 3050. Near Cavan is Farnham Castle. A statue of Lord Farnham, who was burned to death in the railway accident at Abeigle, 20th August, 1868, was erected in 1872.

In 1690 the Enniskilleners, under General Walsey, defeated a much larger body of James II.'s troops, and a portion of the town was burnt. The castle of the O'Reilley's and the Dominican monastery, where General O'Neal, who died in 1649, was buried, have long since disappeared.

CAVATINA, in music, a short air which has no second part, differing in this respect from the *aria*, which has both parts. The term Cavatina is, however, much continued by modern composers, who simply signify by it an air of less important dimensions than the *aria*, as, for instance, Grand's "Salve dimora" and Mendelssohn's "Be thou faithful," each of which bears this name.

CAVE-MEN. In many of the bone caves of Europe the relics of ancient man—either his bones or worked implements—have been found associated with the remains of living and extinct mammals. This race of men—dwellers in natural caverns, who had not yet learned to construct their own habitations—has been styled Cave-men. Among the most ancient actual human remains, the best authenticated is probably the well-shaped average skull found in the Engis Cave, near Liège, imbedded in a bone breccia, and associated with the bones of both extinct and living species of mammals. In the Neanderthal Cave, near Düsseldorf, a skeleton was found which for a time attracted considerable attention, as it was at first considered to be a lower type than any living human being, and therefore an intermediate form between man and the ape; the limb bones were large, with prominent protuberances for muscular attachments, the skull (*b* in fig.) was very thick, very prominent in the brows, and very low in the arch; but it has since been shown that many lower types of individuals are to be found among the existing savages, and that although these remains are probably those of a man of low intelligence, exceptionally muscular, yet other remains, equally ancient, if not more so, are of a type nothing inferior to the average human being. Thus in a cave at Mentone, near Nice, the skeleton of a tall well-formed man, with a more than average-sized skull, has been found associated with the bones of the cave-lion, rhinoceros, &c. The

bones of this skeleton were all in place, about the head lay twenty-two perforated stag's teeth, which had been probably worn as a chaplet, and beside the skeleton lay his weapons of chipped flint. The Aurinae Cave (France) is probably of a somewhat later date; it is supposed to have been a tribal burying-place; in it seventeen skeletons of men, women, and children were found, associated with works of art and bones of extinct animals. Perhaps the most complete series of caves, and those from which we learn most about the habits and employments of these ancient people, are the Perigord Caves along the river Vézère. These consist of a succession of caves, at four



a, Skull—European; *b*, found in Neanderthal Cave; *c*, Skull of Chimpanzee.

different levels above that of the present stream. The uppermost caves, which are of course the oldest, contain the most primitive type of weapons—massive and rude chipped stone implements; in the succeeding lower levels successive stages in the refinement of the weapons are traceable, the flint implements being more carefully finished, and horn needles and dart points for small game introduced. This material in a great measure supplants the chipped stone in the lowest caves, where barbed points of it, for harpoons and lances, occur; also, fish bones, showing that these were captured. Here the horn or ivory dagger handles are ornamented with representations and carvings of the fauna of the time, such as the mammoth, reindeer, glutton, auroch horse, ibex, fishes, &c. Incised figures, the sculptured bust of a woman, and the picture of another standing beside a horse, cut in reindeer horn, are also among the relics of the primitive art from this locality. From this it is evident that these were an intelligent people, and keen observers, also that they were familiar with animals that were extinct before even traditional history. The caves of Kesslerloch (Switzerland) are about the same age, and their weapons are similar, but they were superior artists, faithful representations of the horse, musk ox, reindeer, &c., having been found. The caves of Bruniquet (France) may also be mentioned for the bold figures that have been found.

In the British Isles numerous relics of this ancient people have been exhumed; they consist chiefly of chipped flint implements and split bones. Some of the most noted caves in which these have been found are—Victoria Cave (Yorkshire), where the worked flints occur under boulder clay; Robin Hood and the Pin Hole Caves, in which two distinct types of implements have been found, the older being rude chipped quartzite and the newer chipped flint; in Cefno Cave a human skull and the antlers of a stag have been found; Wookey Hole (Mendip Hills) is described as "a hyæna den, which at intervals had also been occupied by savage men, as the occurrence of charcoal, calcined bones, and distinctly formed implements of flint and chert clearly testified;" Brixham Cave and Kent's Hole, near Torquay, contained numerous early Palæolithic arrow-heads and knives of flint; in the Paviland Cave a human skeleton was found—the Red Lady of Paviland; this was associated with the remains of the mammoth, rhinoceros, cave-bear, &c., but by some the body is regarded

as of subsequent date, having been buried there at a later period. In Ireland, relics of man have been found in the Knockmore Caves (Fermanagh) and Ballinamintra Cave (Waterford), but those from the latter locality are of Neolithic age. On collecting the fragments of evidence supplied from these localities, it appears certain that since the first appearance of man in the British Isles many species of mammals have become either wholly extinct or extinct in this portion of the globe. Of those whose bones have been found associated with contemporaneous traces of man, may be mentioned the mammoth (*Elephas primigenius* and *Elephas antiquus*), bears (*Ursus ferox* and *Ursus arctos*), the cave-lion, hyæna, rhinoceros (*Irhinoceros tichorhinus* and *Rhinoceros Nemitaceus*), hippopotamus, reindeer, Irish elk (*Cervus megaceros*), &c.

It is very difficult to determine when man first visited these islands; as he is an animal without natural clothing, it seems probable that he appeared first in tropical regions, and it was not till much later that he migrated north. By many, Postglacial, or at earliest Inter-glacial time is considered as about his advent in Britain; however, other competent judges take a different view of the subject. Among them Ramsay states "that there is no doubt that many of these caves date from before the Glacial epoch," and that men frequented "the caves of Devonshire while the more northern areas were shrouded in ice;" and adds that it seems probable that man inhabited the British area "before the Glacial epoch began, and that he retired to the south before the advancing glacier ice-sheets. The changing climate might by degrees suit him well enough, for do not the Greenlanders of our own time live in comfort in their own way among or on the edges of the snows and glaciers of Greenland?" He also states, "There can be no doubt that man was contemporary with extinct mammalia; and there can be little doubt that his origin in our island dates back to a time when the country was united to the mainland, and that, along with the great hairy mammoth, the rhinoceros, the hippopotamus, lion, hyæna, and other mammalia partly extinct, he travelled hither at a time when the arts were so rude that he had no means of coming except on foot."

The British Isles do not furnish us with much evidence as to the habits of these early people, but from the cave deposits of France, Belgium, and Switzerland we get a fair insight of their pursuits and mode of living. Professor Boyd Dawkins, in his description of the Wookey hyæna-den, thus speaks of the race:—"Man appeared from time to time upon the scene, a miserable savage armed with bow and arrow, unacquainted with metals, but defended from the cold by coats of skin. Sometimes he took possession of the den, and drove out the hyænas, for it is impossible for both to have lived in the same cave at the same time. He kindled his fires at the entrance to cook his food and to keep away the wild animals; then he went away, and the hyænas came back to their old abode." The implements of these Cave-men were all of Palæolithic type, and it appears that before the Neolithic age man had acquired the art of constructing his own habitation, for only a few stray weapons of this type have been found in cave deposits. The Palæolithic implements are referable to two ages, the older being found contemporaneous with the mammoth, and the more finished are of Reindeer age, when bone and horn instruments were also much in use for the capture of small game and fish.

There can be little doubt that these men were very primitive savages, but they were probably a well-developed race, tall and strong, and not at all inferior in anatomical characters to good examples of existing savages. They were not cannibals, nor did they burn their dead, but buried them with their arms; in some instances performing sacrifice, which showed a belief in a deity. They were unacquainted with the useful arts of making pottery, of

spinning or weaving, nor did they keep domestic animals, nor practise agriculture. They were hunters, and later on fishermen, probably spearing or harpooning their fish, and were thus well acquainted with the animals they pursued. That they were keen observers is evident from the incised pictures they have left us, bold and faithful, especially those from Kesslerloch. Personal adornments were not neglected, the ladies of the period being foremost in the art, perforated shells and teeth (necklaces and head-dresses), ear-rings, and other ornaments, carved in bone, horn, or ivory, having been found; lumps of red oxide of iron, and the slabs of stone on which it was ground, also occur, which were either the primitive form of the modern "rouge," or else were used by both sexes for tattooing.

CAVENDISH EXPERIMENT, THE, is still considered the most trustworthy investigation into the weight of the whole earth. It was devised, in 1798, by Henry Cavendish, nephew of the then Duke of Devonshire, a good chemist and man of science generally, who, among other successful experiments, decomposed water. Reich of Friburg, and after him Francis Baily, also made this very careful experiment, Baily even repeating it 2000 times. The principle involved is the comparison between the attraction of the earth and the attraction of a body of known weight upon a third body. It is manifest that if the earth attracts a body with a certain force, and a pound weight attracts the same body with a fraction of that force, the mass of the earth will be greater than a pound weight in the same proportion as the force it exerts on that body is greater than the force exerted on the same body by the pound weight, for the attraction of gravitation varies directly as the mass: anything twice as heavy attracts twice as powerfully. Two small equal leaden balls, their weight accurately measured, were fixed at the two ends of a wooden rod, 6 feet long, suspended by its middle by a fine wire—so that the rod with its balls hung in equilibrium, but could twist on the wire support if anything caused it to swing. This apparatus being brought to perfect equilibrium and absolute rest, Cavendish brought two large leaden globes, whose weight was precisely known, near the two small balls, one near each, but upon opposite sides, so that the pull was in the same (circular) direction; and he found, as he had anticipated, that the wooden rod with its small balls turned slightly on its suspension axis of wire. The deviation was exactly measured, and then the attraction was known; calculation alone was now necessary, since the density of the earth was to the density of lead as the attraction of the earth (i.e. ordinary weight) to the attraction of a leaden globe of the size of the earth. The size of the earth being known by actual measurement [see BASE LINE], this latter element could be readily ascertained.

The experiment of Cavendish himself made the earth to appear 5·480 times the weight of water; those of Reich, 5·438; and those of Baily, 5·660. We may therefore take the earth to be 5·639 times (the average of these) as heavy as water, and its total weight is

6,000,000,000,000,000,000,000 tons.

CAVERY, a river in the south of India, which rises among the Western Ghats, in about 12° 26' N. lat., 75° 34' E. lon., 4000 feet above the sea. It is not navigable, except for small boats. It flows E.S.E. to Seringapatam, and afterwards forms the eastern boundary of Coimbatour, towards the Carnatic frontier. At Trichinopoly it is divided into two branches, the most northern of which, under the name of Coleroon, falls into the Sea of Devicotta. The southern branch retains the name at Cavery, and is afterwards subdivided into several branches, which, by means of canals and embankments, are employed to fertilize the plains of Tanjore. The whole course of the Cavery is about 470 miles.

CAVES are large hollows formed in the earth by various natural agencies, chiefly either mechanical or chemical, but more often a combination of both. Thus the sea, along a coast composed of strata of variable hardness, excavates the softer material. Such caves, often very large, are to be found not only along the present coast-line, but also along raised beaches. In limestone strata the sea works more efficiently, for here its mechanical effect is aided by chemical influences, producing caves of large dimensions, and when more than one opening exists sometimes produce "blowing" or "putting holes," where the air, mixed with spray, is expelled with great violence and a bellowing noise from one aperture when the wave enters at another. The most abundant and extensive caves are those occurring in limestone strata; they are chiefly of chemical origin, and have been produced by water percolating through the cracks and fissures of the rock. [See CALCAREOUS SPRINGS.] In this way the channels in the limestone strata are being constantly enlarged, until a vast labyrinth of chambers and passages is excavated, forming an extensive and complete system of subterranean drainage. This occurs in many limestone districts, especially of carboniferous age, as in Derbyshire, where, in some of the lead mines, it is found impracticable to go below the natural water-level of the rocks, they are of such a cavernous nature. These caverns eventually become too large to be self-supporting; the roof gives way, leaving a rugged gorge, which atmospheric agencies convert into a valley, probably with a river flowing through it. Many of the bone caves possibly originated in this way, having been formerly underground river beds, that are now left dry by the water finding a channel at a lower level. The floor of these limestone caves is usually covered with stalagmite resulting from the drip of calcareous water from the roof, from which stalactites hang, both assuming fantastic forms.

CAVIA'RE is the name given to the prepared roe of the sturgeon, which is much esteemed in Russia and Germany as an article of diet. It is often taken before dinner upon toasted bread, seasoned with oil, vinegar, or lemon-juice according to taste, to serve as a stimulus to the appetite. It is said that its full excellence is only enjoyed when it is eaten by the river-side as prepared from the fresh roe. Very large quantities of this food are prepared from the different kinds of sturgeon caught in the river Volga and the Caspian Sea, and a considerable export trade is carried on in it. Astrakhan is the chief seat of this important and remunerative trade. The flavour appeals to an educated palate, so that Shakspeare speaks in "Hamlet" (ii. 2) of a play which "pleased not the million, 'twas caviare to the general" (people), in a phrase which has passed into a proverb.

CAVO RELIEVO is a kind of relief almost peculiar to Egyptian sculpture. Instead of the figures rising from a ground they are cut into it, but in relief, not in intaglio. The edges of the figures are deeply sunken, and the more prominent parts only are level with the ground, much as the impression of a well-cut seal rises amidst the surrounding wax, in which it is still deeply imbedded. The Egyptian slabs at the British Museum, or the clever coloured reproductions of them at the Crystal Palace, Sydenham, give numerous examples of this effective decoration.

CAVOUR, COUNT CAMILLO DI, the younger son of an ancient Savoyard family, was born at Turin on 10th August, 1810. Cavour was sent at an early age to the military academy, where he obtained the rank of lieutenant in the corps of engineers, and shortly afterwards was appointed one of the royal pages. He resigned his commission and his position at court, however, in order to gratify his desire to travel, and proceeded to England. Judging from his own observations, he attributed the supremacy of England less to the vigour and energy of the national character than to her institutions, and consequently became

an earnest admirer and advocate of constitutional monarchy. With these views it is not surprising that, on his return to Turin, Count Cavour should have taken part in the disturbances that compelled the King of Piedmont to grant the constitution of 1848. He was chosen with Santa Rosa, Brofferio, Durando, and others, to form a deputation to urge upon the king the danger of longer delay in yielding to the demands of his subjects. Shortly after the proclamation of the constitution, Cavour was elected deputy to the chamber by the first electoral college of Turin; but his debut in political life does not appear to have been very successful, and at the next election he failed to obtain a seat. He was, however, re-elected in 1850, and successively nominated minister of agriculture, commerce, marine, and finance. In 1852, after a visit to France and England, he was commissioned by the king to form a cabinet, and, with the exception of a very brief period in 1859, he held the position of prime minister till his death. In January, 1855, through Cavour's influence, Sardinia was induced to make common cause with France and England by aiding in the Crimean War—a step which, when first proposed, met with strong opposition in the Sardinian Chambers, but which was certainly the wisest, as to Italy it proved the most advantageous, course that could have been taken, involving as it did the recognition of her existence as a nation by the most powerful states in Europe, and her right to be heard in their councils. Accordingly, on the part of Sardinia, Cavour took his place in the conferences which assembled in Paris to settle the terms of peace. He embraced the opportunity of bringing the condition of his country, and of pleading her rights, before the conferences. The jealousy and resentment of Austria were roused, and in March, 1857, the Austrian minister was recalled from Turin, and the Sardinian minister from Vienna. Having ceased to hope for material aid from the British government in the struggle now seen to be inevitable, Cavour naturally turned to France; and after a series of negotiations and arrangements he had, in the end of March, 1859, an interview with Louis Napoleon at Paris, when the plan of operations, on the breaking out of hostilities, was finally settled. The warmly-cherished hopes of a free and united Italy "from the Alps to the Adriatic," inspired by the magniloquent promise of his powerful ally, Cavour now thought in a fair way of being realized. The pleasing illusion was soon, however, dispelled. Burning with indignation at the abrupt and, to Sardinia, insulting peace which Louis Napoleon had made with his Austrian brother at Villafranca, and finding the counsels which he urged on his sovereign at that crisis rejected, Cavour resigned his office as premier, and retired to his property at Lerì. It was soon found, however, that his services could not be dispensed with in such a state of affairs as then existed, and early in 1860 he was again prime minister. From first to last in this capacity he displayed the most dexterous statesmanship, and by his efforts to improve her financial, commercial, and agricultural condition did incalculable service to his country. He died at Turin on 6th June, 1861. In addition to his abilities as a statesman he acquired some renown as a journalist, and was the author of several valued works on political economy.

CAVY (Cavia) is a genus of animals, the type of the Caviæ—a family of RODENTIA. In this family the incisor teeth are short, and the molar teeth are rootless; the latter are sixteen in number, and they exhibit more or less complicated folds of enamel. The clavicles are imperfect. The front feet are either three or four toed, the hind feet having generally three, and in some cases five, toes, with the two outer digits feebly developed. The claws are strong, compressed, and arched. The caviæ are all inhabitants of the South American continent. Their bodies are clothed with short hair, the ears are moderately developed, while the tail is either very small or altogether wanting.

The Restless Cavy (*Cavia aperea*) is generally considered to be the wild original of our domestic variety of cavy, commonly called the GUINOA-PIG. It is an inhabitant of Brazil, and is found in Paraguay and La Plata. The hairs are brown, with reddish-yellow points, the throat and lower parts being either white, grayish, or dirty yellow. In the tame varieties the prevailing tint is white, with black and orange-coloured spots. According to Rengger this species lives wild, in little societies varying numerically from six to fifteen individuals. Its principal feeding time is in the morning and evening. In respect of its procreative powers in the domesticated state, few animals surpass it. The female produces from six to twelve young at a litter, and this frequently takes place several times during the year. In six or eight weeks the young are themselves ready to give birth to other offspring.

The Bolivian Cavy (*Cavia boliviensis*) occupies only the higher altitudes of Bolivia. The fur has a grayish-yellow colour, being whitish underneath. The incisors have an orange-yellow tint. This species is very shy.

The Rock Cavy (*Cavia rupestris*) is a native of the rocky districts of Brazil generally. It is likewise found abundant in the higher regions bordering the Rio Pardo and Rio de San Francisco. It is a large species, measuring 13 or 14 inches in length, and is remarkable as having the nails of the toes blunt, and so small that they scarcely project beyond the large digital toe-pads with which the feet are also supplied. It has no tail, and the ears are shorter than one-half of the head. The flesh is considered good eating.

The Patagonian Cavy (*Dolichotis patagonica*) frequents the desert wastes of the southernmost parts of America, extending as far north as La Plata. It is considerably larger than our common hare, a full-grown example weighing as much sometimes as 30 lbs. The fur presents a mixture of gray and rust colour, the under parts of the head, neck, and belly being white. The molars have no roots, the incisors being smooth and nearly white. The fore feet are four-toed, the hinder ones three-toed. The large ears are broad at the base, and more than half the length of the head. The legs are high—a feature by which it ought to be readily distinguished from the hare, but is generally overlooked by uninformed travellers. In regard to its habits, it is, like its congeners, fond of burrowing, and according to Darwin, “when found in the same districts with the viscacha, it will avail itself of the excavation; of this little animal for a retreat. The Patagonian cavies wander at times to great distances from their homes, and usually two or three are seen together on these occasions. The animal in its mode of running more nearly resembles the rabbit than the hare, and though its limbs are long it does not run very fast. It seldom squats after the manner of the hare, is very shy and watchful, and feeds by day.” The female produces two young at a birth.

Several other species of cavy are found in Brazil and different regions of South America.

The AGOUTI, CAPYBARA, and PACA belong to the Cavidae.

CAW'DOR, a village of Scotland, $8\frac{1}{2}$ miles S.W. of the town of Nairn. Cawdor Castle was founded about 1454, and is the best preserved feudal castle in Scotland. The legend that King Duncan was murdered by Macbeth here is quite mythical, but in a dungeon is an old hawthorn tree about 10 feet in height. It is said that the founder was told by a hermit to lade an ass with gold, and to build his castle at the third hawthorn tree at which the animal should stop. This is the tree in the dungeon, and it is held in great reverence.

CAWNPORE (correctly *Kampur*), a district in the lieutenant-governorship of the North-western Provinces, British India, lying between $25^{\circ} 56'$ and $26^{\circ} 57'$ N. lat., and between $79^{\circ} 34'$ and $80^{\circ} 88'$ E. lon. The area is 2336 square miles, and the population in 1881 was

1,200,000. It is the westernmost districts of the Allahabad division.

The district forms part of the Doab or great alluvial plain between the Ganges and the Jumna, and it does not materially differ in its general features from other portions of that monotonous tract. It consists for the most part of a level plateau, only varied by the courses of the minor streams whose waters swell the great boundary rivers, and by the steep ravines which channel the friable soil of the plain. The clay of part of the plain is naturally dry and thirsty, but it has been converted into a prosperous agricultural region by the waters of the Ganges Canal. No fewer than four branches of that great engineering work enter the district of Cawnpore at different points, while minor distributaries run from them in every direction over the surrounding fields.

Groves of tamarind and *mahua* not uncommonly overshadow the village temples or the more ambitious mosques. The fauna of the district includes leopards, wolves, *nilgati*, antelope, deer, foxes, and jackals; partridges, pea fowl, and sand-grouse abound, while water-fowl are common in the low-lying marshy flats. The system of tillage in Cawnpore is that common to the whole Doab. There are two main agricultural seasons—the *kharrif*, or autumn harvest, and the *rabi*, or spring harvest. The *kharrif* crops are sown after the first rain in June, and include rice, cotton, *bagia*, *joar*, *moth*, and other food-stuffs. Most of these staples are reaped in October; but the early rice is harvested in September, while cotton is not ready for picking until February. Among the minor crops are—oil-seeds, opium, spices, tobacco, and potatoes. Sugar-cane is extensively grown on the better soils, and indigo is cultivated for the sake of the seed, which is exported in large quantities to Behar.

The climate of Cawnpore is like that of the other Doab districts. From the middle of April to the 1st of July it is excessively hot and dry, and westerly winds prevail. After this the monsoon is ushered in by damp east winds. The rainy season lasts till the end of September or beginning of October; the cold weather commences about the 1st of November. The district is on the whole well drained, and is therefore fairly healthy during the rainy season.

CAWNPORE CITY, the administrative headquarters of above district, lies on the right bank of the river Ganges, 130 miles above its junction with the Jumna at Allahabad. It is distant from Calcutta 628 miles north-west, and from Delhi 266 miles south-east. It is the fourth city in size and importance of the North-western Provinces, having a population of 151,441. The cantonments and civil station of Cawnpore lie along the right bank of the Ganges, while the native city stretches inland towards the south-west, and also fills up the space between the military and civil portions of the European quarter. The modern origin of Cawnpore deprives it of architectural attractions, and it cannot boast of such ancient palaces of handsome mansions as adorn Agra, Benares, and other historic cities in India. The few buildings with any pretensions to beauty or elegance have been erected during the last fifty years by bankers, merchants, or pleaders; and the general aspect of the streets discloses little beyond mud-huts and plain brick edifices. Two large cotton mills give employment to a considerable number of operatives, who manufacture yarn, cloth, and tents, and supply the native weavers with material for their craft.

Cawnpore possesses no historical interest in early times, being a purely modern creation to meet the military and administrative needs of the British government. The city first arose after the defeats of Shujah-ud-daula, nawab-wazir of Oudh, at Buxar, in October, 1764, and at Kora, in May, 1765. The nawab then concluded a treaty with the British, granting them the right of stationing troops at

two places in his dominions, Cawnpore and Futtegarh. In 1801 the surrounding country came finally into the British possession, by cession from the nawab-wazir, and the headquarters of a district were fixed in the city. No events of historical note occurred between the annexation and the mutiny of 1857; but in that year Cawnpore was rendered memorable by the leading part which it played in the operations of the mutineers. The struggle lasted from May to December, but the station itself was never lost for more than a few days. News of the outbreak at Meerut reached Cawnpore on the 14th of May. Eleven days later the Nana Dandhu Panth of Bithur, adopted son of the last peshwa, Bajji Rao (generally known as Nana Sahib), was placed in charge of the treasury. On the 6th of June the native troops mutinied, broke open the gaol, and burned the public offices. Next day the Nana opened fire on the European barracks, which had no further fortification than a mud parapet, 5 feet in height. After three weeks' cannonade the position became untenable, and the garrison capitulated under a promise of personal security and safe conduct to Allahabad. On the 27th they embarked in boats on the Ganges for Allahabad at the Satti Chama *ghat*, a landing-place near the spot where the Memorial Gardens now stand. Before they could put off, they were treacherously fired upon from the bank, and all destroyed or captured, except one boat-load, which escaped for the time into the Futtegarh district; the women and children were carried off to the Savada Kothi, where they were all cut to pieces, by the Nana's orders, at the first sound of Havelock's guns outside Cawnpore. About 200 bodies were taken out of the well into which they were thrown, where the well-known memorial now stands. On the 16th of July Havelock stormed the city, and the Nana fled precipitately to Bithur. Four days later General Neill arrived with a reinforcement of 400 Europeans. Havelock thence advanced unsuccessfully into Oudh, and retreated at last to Cawnpore on the 10th of August. Shortly after General Outram reached the city and marched on to the relief of Lucknow, which was successfully accomplished on the 25th. Sir Colin Campbell's and Colonel Greathed's columns passed through on different occasions in October, and on the 26th of November the Gwalior mutineers approached Cawnpore. General Windham attacked and defeated the rebel force; but, being strengthened by Oudh insurgents, they again assaulted the city, which they wrested from the British on the 27th. They held it, however, only for a single night, as Lord Clyde's force marched in on the evening of the 28th, drove out the mutineers, and utterly defeated them next day outside the city, with the loss of all their guns. After the reorganization of the district the site of the massacre was laid out as Memorial Gardens, and an ornamental building was placed over the well into which the bodies were flung. The surrounding wall is pierced with rows of lancet windows or openings having trefoil mullions, and handsome bronze doors close the entrance. Within stands a marble figure of an angel by Baron Marochetti. The well forms the chief object of interest to visitors in a city otherwise devoid of architectural interest. A memorial church also occupies the site of General Wheeler's intrenchments in the cantonment.

CAXTON, WILLIAM, to whom England owes the introduction of printing, was born probably in 1412, in the Weald of Kent. He was put apprentice to one Robert Large, a mercer or merchant of considerable eminence, who was afterwards successively sheriff and lord mayor of London, and who, upon his death in 1441, remembered Caxton in his will by a legacy of 20 marks. Either upon his own account, or as agent of some merchant, Caxton travelled in the Low Countries for a short time. In 1464 we find him joined in a commission with one Richard Whitchill, to continue and confirm a treaty of trade and commerce between

Edward IV. and Philip, duke of Burgundy, or, if they found it necessary, to make a new one. Seven years afterwards Caxton describes himself as leading a life of ease, when, "having no great charge or occupation," he set about finishing the translation of Raoul le Fevre's "*Recueil des Histoires de Troye*," which he had commenced two years before, in 1469. The original was the first book he printed, and this translation the third. In the Low Countries he entered into the service of Margaret, duchess of Burgundy, daughter of Duke Philip, who encouraged him to finish his translation of Le Fevre's "*History of Troy*." From the prologues and epilogues of this work we discover that he was now somewhat advanced in years, and that he had learned to exercise the art of printing, but by what steps he had acquired this knowledge cannot be discovered; his types, however, show that he acquired it in the Low Countries. The time of his return to his native country is not known with certainty; but the usual supposition has been that he brought the art of printing into England in 1474, and printed "*The Game and Playe of the Chesse*." In 1477 he had undoubtedly quitted the Low Countries, and had taken up his residence in the vicinity of Westminster Abbey, where and in which year he printed his "*Dictes and Sayings of the Philosophers*." Stow says he first exercised his business in an old chapel near the entrance of the Abbey; but a very curious placard, a copy of which, in Caxton's largest type, is now at Oxford in the late Mr. Douce's library, shows that he printed in the Almonry. His death seems fixed, by two or three entries in the parish accounts of St. Margaret, Westminster, to the year 1491 or 1492, in which we read, "Item, atte buryng of William Caxton for iiij. torches viij. viij^d. Item, for the belle at same Bureyng viij^d."

Caxton, Mr. Warton observes, by translating, or procuring to be translated, a great number of books from the French, greatly contributed to promote the state of literature in England. The two largest collections of the productions from Caxton's press now known are those in the British Museum and in Earl Spencer's library at Althorpe. The four-hundredth anniversary of his introduction of printing into England was celebrated, and a Caxton Memorial Exhibition held, in London, in 1877.

CAYENNE, or **FRENCH GUIANA**, extends along the coast in the east part of Guiana, South America, from the river Marony, which separates it from the Dutch Guiana, to the Oyapock, which divides it from Brazil. The area is not well defined, but according to good authorities is supposed to be about 18,000 square miles. Nearly the whole tract is still covered with large forest trees, the cultivated portion lying along the coast and extending about 25 miles inland. The chief products are—cocoa, coffee, spices, dyewoods, rice, maize, and bananas. The principal rivers are the Marony and the Oyapock. The colony is divided into two districts, Cayenne and Sinnamary, and its government is similar to that of other French possessions. The trade with French Guiana is unimportant, and its chief importance to the mother country consists in its being the principal seat of her penal settlements. Political prisoners have been transported hither since 1851, and in 1871 the worst cases of the communists, such as convicts reprieved from capital condemnations and sentences to hard labour for life, were reserved for Cayenne. The number of prisoners is about 7000. Gold was discovered in 1874.

CAYENNE, the capital, is a seaport situated on the north-west extremity of an island, and at the mouth of a river, of the same name. It is the only town of any importance in the colony. The streets are broad, clean, and well kept. It is divided into two parts, known as the old and new town. The chief buildings are—the government house, the fort, marine barracks, several churches, a nunnery, and civil, military, and leprosy hospitals. The harbour is

shallow at the entrance, but within vessels up to 800 tons burden can lie safely. The chief exports are gold and the produce of the country, and clothing, provisions, and tobacco form the principal imports. The place cannot be considered healthy—during December to March a trying wind from the north is prevalent, and the vast swamp on one side of the town occasions all kinds of fevers. The name originates in a spice, Cayenne pepper, made of the dried seeds of a native plant, a species of capsicum.

CAYENNE PEPPER. See CAPSICUM.

CAYMAN. See ALLIGATOR.

CAYMANS, three small islands to the west of Jamaica, belonging to Great Britain. Grand Cayman is 24 miles long and 2½ miles broad. It is low and covered with trees, chiefly cocoa-nut. On the western side there is a large village called George's Town. The rest of the island is thinly inhabited. The other two, called Little Cayman and Cayman Brack, are barren and uninhabited.

CAZEM'BE or **KAZEM'BE**, the name of an hereditary African prince, which is applied to the territory over which he has rule. The limits of this country are not clearly defined. It is situated to the south of Lake Moero and to the north of Bangweulu, occupying the upper basin of the Chambeze-Lualaba River, with its centre somewhere about 12° S. lat. and 31° E. lon. Its area has been estimated at about 120,000 square miles, with a population of 500,000. The country is sometimes called Quichinga.

CEANO'THUS is a genus of plants belonging to the order RHAMNACEÆ, the BUCKTHORN family. There are twenty-eight species, natives of North America, small trees or shrubs, with alternate leaves, and the flowers generally arranged in a terminal thyse. The roots are large, astrigent, and of a reddish colour, on which account the plant has got the common name of "red root." The flowers in the different species are yellow, white, or blue. The calyx-segments, petals, and stamens are in each case five. The ovary is three-lobed. The disc is thick, filling the tube of the calyx.

Ceanothus americanus is a shrub cultivated in English gardens, with small white flowers on white slender stalks. The leaves are sometimes used as a substitute for tea, whence the name "New Jersey tea." The bark of the root is an astringent medicine, and in Canada is used to dye wool of a nankin or cinnamon colour.

CEARA, a province of Brazil, on the coast of the Atlantic, N.W. of Cape St. Roque, between 2° 40' and 7° 25' S. lat. and 37° 40' and 41° 36' W. lon. It has Piauhy on the W. Parahyba and Pernambuco on the E. and S., and is a rich and fertile province, abounding in the usual tropical products, especially balsams, gums, fruits, and resins, and having also rich mines of gold, silver, iron, and copper.

The principal rivers are the Croyahu, Ceara, and Jaguaribe. The lower grounds on the coast have the form of an amphitheatre; from this the ground rises inland in plateaus and ridges towards the Sierra Cayreris and Ibrapaha. The area is 50,260 square miles, and the population 730,000.

CEARA, or **FORTALEZA**, capital of the above province, is situated at the mouth of a river of the same name. It is regularly built, and is divided into a new and old town. It has considerable exports of cotton, sugar, and coffee.

CEBUS. See CAPUCHIN.

CECIDOMYIA is a genus of two-winged flies belonging to the division NEMOCERA of the order DIPTERA. These insects are always of small size. Many of them deposit their eggs on the young buds of various kinds of plants, where the larvæ when hatched produce galls, in which they subsist and undergo their metamorphosis. The body is elongated and slender. The antennæ are as long as the body, generally twenty-four jointed, the joints being hairy. The legs are very long; the first joint of the tarsi

is very short, the second long. The females usually have a long ovipositor.

The larvæ of some of these insects do much damage to the grain crops. Among the worst offenders are the **HESSIAN FLY** (*Cecidomyia destructor*) and the **WHEAT FLY** (*Cecidomyia tritici*).

CECIL, ROBERT. See SALISBURY, LORD.

CECIL, WILLIAM. See BURLINGTON, LORD.

CECILIA, ST., the patron saint of music, was, according to legend, a noble Roman maiden, converted to Christianity, who suffered martyrdom about 230 A.D. She had made a vow of perpetual virginity, but was married by her parents to a young pagan, Valerian, whom she persuaded to embrace Christianity and respect her vow. They were both put to death for refusing to sacrifice to idols, about the year 230 A.D. Her claims as patroness of music seem to be derived from the purely legendary record that she often joined instrumental with vocal music in the public service of Christ. She is regarded as the inventor of the organ, and in the famous picture by Domenichino at Bologna she is represented with a small "organ" or large Pandean pipes in her hand. Her festival day, the 22nd November, is still celebrated in a church in Rome dedicated to her, dating from the sixth century, with splendid music. Many famous painters and poets have immortalized her by their art, Dryden's and Pope's beautiful odes on "St. Cecilia's Day" especially being well known, the first being set to music very finely by Handel.

CECROPIA is a genus of trees which are commonly known as Trumpet Trees. They are natives of America, living in the tropical forests on the low-lying land of river banks. The smooth light-yellow coloured stem rises to a height of 50 feet, but is of slender proportions, not being more than 12 inches in diameter, and varying little for some distance from the ground. The tree has been compared to a huge candelabrum, for the branches stand out at right angles to the stem, and round these are ranged the smaller branches, with the leaves at their extremities, so that the head of the tree is large and spreading. The leaves remind one of the horse-chestnut. The cecropia trees are interesting in many respects, but attention has been more particularly called to them of late years on account of the observations made on the connection between them and ASTS. The flowers grow in catkins, which are long, whitish, and worm-like. A number of catkins grow on the same stalk, and are inclosed when young in the folds of a protecting sheath that soon falls off. Staminate flowers only are found on one tree, pistillate flowers on another. The corolla is altogether wanting. The calyx, in the pistillate flower, consists of a thin membrane which completely incloses the ovary, leaving the stigma protruding at the top. The staminate flower has two stamens with a more open calyx. As the ovaries ripen into one-seeded fruits, the receptacles on which they are fixed become fleshy, and form a favourite article of food with the inhabitants. The end of each young branch is inclosed in a sheath, which gradually opens and exposes to view the young leaf and catkins. When the sheath falls it leaves a scar, and this ring round the bark remains and marks the position of a partition. The stem and branches are hollow, so that the partitions divide them off into a series of chambers. From the hollow stems the natives make rude musical instruments. The wood is soft, and a fire may be kindled by rubbing it briskly against a harder piece of wood. It is so light that it is employed to make floats for fishing nets. The tender young leaves make good pot herbs, and a kind of caoutchouc is obtained from the milky juice of the tree. There is a considerable quantity of saline matter in the trunk and branches, which is used for the purification of sugar. The bark supplies fibre for cordage, and its astringency makes it a remedy in diarrhoea, dysentery, and other diseases.

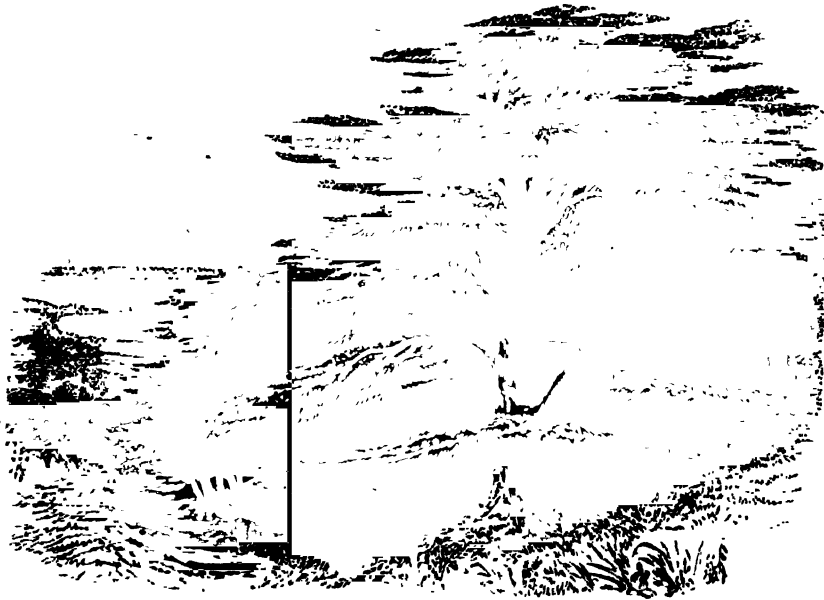
CECROPS, the mythical founder and first king of Athens, seems to have been a Pelasgic hero. His son succeeded him, and his daughters were Pandrosos, Agraule, and Herse, of whom the first has dedicated to her memory one of those three exquisite temples called together the Erechtheum, at Athens. Cecrops is often supposed to be contemporary with Moses. To him are attributed civil government, and religious and domestic rites among the Greeks; and in his long reign occurred the contest between Athena and Poseidon as to who should be god of Athens, Cecrops deciding for the goddess. Hence the citadel of Athens is called Cecropia.

CE DAR is a popular name applied to many very distinct trees. Most frequently the name denotes the cedar of Lebanon (*Cedrus Libani*).

The genus *Cedrus*, by some botanists made a subgenus of *Abies* or *Pinus*, is kept separate by Bentham and Hooker in their "Genera Plantarum." The leaves are evergreen, and grow in clusters. The cones of *Cedrus Libani* are 3 to 5 inches long, erect, blunt, oblong, and composed of broad, closely packed scales, which are of a purplish-brown colour, and a little thickened at the mar-

gin. They take three years to ripen, and generally do not fall for several years. Mount Lebanon, the range of Taurus, and the Atlas Mountains are the native spots of this most stately and magnificent tree, which compensates for its want of height by its huge wide-spreading arms, each of which is almost a tree in itself. Since the occupation of Cyprus by the English, a dwarf variety of this tree has been discovered on the mountains, thus connecting the Lebanon and Atlas districts. The only other species that belongs to the genus, *Cedrus Deodara* (the **DEODAR**), is a native of the Himalayas and the mountains of Tibet.

When Sir J. Hooker visited the cedar grove of Lebanon he camped at the head of the Kedisha valley, at an elevation of 6172 feet. He ascended the Lebanon twice, with the view of studying the relative position of the grove to the surrounding country. The trees were counted and measured. A section was made of the lower limb of one of the oldest trees, which lay dead on the ground. This section gave them "a totally different idea of the hardness of cedar wood from what English-grown specimens do." "So far," adds Sir J. Hooker, "as is at present generally known, the cedars are confined on Lebanon to one spot, at the



Cedars of Lebanon.

head of the Kedisha valley; they have, however, been found by Ehrenberg in valleys to the northward of this. The Kedisha valley, at 6000 feet elevation, terminates in broad, shallow, flat-floored basins, and is 2 to 3 miles across, and as much long; it is here in a straight line 15 miles from the sea, and about 3 or 4 from the summit of Lebanon, which is to the northward of it. These open basins have sloping sides, which rise from 2000 to 4000 feet above their bases; they exactly resemble what are called 'corries' in many highland mountains; the floor of that in which the cedars grow presents almost a dead level to the eye, crossed abruptly and transversely by a confused range of ancient moraines, which have been deposited by glaciers that, under very different conditions of climate, once filled the basin above them and communicated with the perpetual snow with which the whole summit of Lebanon was at that time deeply covered. The moraines are perhaps 80 to 100 feet high; their boundaries are perfectly defined, and they divide the floor of the basin into an

upper and lower flat area. The rills from the surrounding heights collect on the upper flat and form one stream, which winds among the moraines on its way to the lower flat, whence it is precipitated into the gorge of the Kedisha. The cedars grow on that portion of the moraine which immediately borders this stream, and nowhere else; they form one group about 400 yards in diameter, with an outstanding tree or two not far from the rest, and appear as a black speck in the great area of the corry and its moraines, which contain no other arborescent vegetation, nor any shrubs, but a few small berberry and rose bushes that form no feature in the landscape. The number is about 400, and they are disposed in nine groups, corresponding with as many hummocks of the range of moraines. They are of various sizes, from about 18 inches to upwards of 40 feet in girth; but the most remarkable and significant fact connected with their size, and consequently with the age of the grove, is that there is no tree of less than 18 inches girth, and that we found no young trees, bushes, nor even

seedlings of a second year's growth. We had no means of estimating accurately the ages of the youngest or oldest tree, nor shall we have till the specimens of the former arrive. It may be remarked, however, that the wood of the branch of the old tree, cut at the time, is 8 inches in diameter (exclusive of bark), presents an extremely firm, compact, and close-grained texture, and has no less than 140 rings, which are so close in some parts that they cannot be counted without a lens. This specimen, further, is both harder and browner than any English-grown cedar or native deodar, and is as odoriferous as the latter. These, however, are the characters of an old lower branch of a very old tree, and are no guide to the general character of the wood on the Lebanon, and still less to that of English-grown specimens, which are always very inferior in colour, odour, grain, and texture. Calculating only from the rings in this branch, the youngest trees in Lebanon would average 100 years old, the oldest 2500—both estimates no doubt widely far from the mark. Calculating from trunks of English rapidly-grown specimens, their ages might be calculated as low respectively as 500 and 200 years; while from the rate of growth of the Chelsea cedars, the youngest may be twenty-two, and the oldest 600 to 800 years old."

It is questionable whether the cedar of Lebanon was much employed by the Jews for building purposes. Sir J. Hooker has carefully examined this question. "Whether," he says, "the grove has much diminished within the historic period, is a question which can only be decided by a careful collection and scrutiny of the records of old travellers. It would not surprise me if proofs existed of its not having materially decreased since the days of Solomon, for it is very doubtful whether the wood was ever largely used in Jerusalem for building purposes. The word cedar, as used in the Bible, applies to other trees, and only certainly to the *Cedrus Libani* when coupled with some distinctive epithet. The foreign timber trade was, in Solomon's time, in the hands of the Phœnicians, and the quantity of first-rate oak and pine on all the coast ranges from Carmel northwards was so great that it is improbable that the almost inaccessible valleys of the Lebanon should have been ransacked for a wood that has no particular quality to recommend it for building purposes. The lower slopes of the Lebanon, also, bordering on the sea were and are covered with magnificent forests. So that there was little inducement to ascend 6000 feet, through 20 miles of a rocky mountain valley, to obtain a material which could not be transported to the coast without the utmost difficulty and expense. It is further to be remarked, that it is difficult to reconcile the hypothesis of the former great extent of the cedar forests with the fact of the almost only existing habitat being the moraines of one of the most populous valleys on the mountain. Of mountain corries with the same elevation as that of the cedars, there are hundreds on the Lebanon, some said to be almost inaccessible, and others quite uninhabited; had the cedar ever formed continuous forests on the mountain, from which it had been removed by man, we should certainly expect to find extensive groves in such localities. I desire not to be misunderstood in this matter, for the question is of some scientific importance. I do not doubt that the *Cedrus Libani* is repeatedly alluded to in the Old Testament, by the prophets especially, who aptly and unmistakably designate that tree; but if, as I believe is allowed by the best Biblical critics and Hebraists, the word cedar applies in Chronicles, &c., to more than one kind of tree, it is, in my opinion, an open question whether the *Cedrus Libani* is one of those which supplied most of the timber employed in building Solomon's Temple. The cypress (also called cedar by the ancients), the *Pinus Halepensis*, and the tall fragrant Juniperus of the Lebanon, with its fine red heart-wood, would have been far more prized on every account."

The Mount Atlas Cedar is a variety (*Atlantica*) of the *Cedrus Libani*, and the Indian Cedar is another name for the Deodar.

The Barbadoes, Bermuda, Red, Sharp, and Virginian Cedars are species of Juniperus. The Sweet scented Barbadoes Cedar, the Bastard Cedar, Honduras Cedar, and Red Cedar of Australia are species of *Cedrela*. The Bastard Cedar of Jamaica is *Guazuma ulmifolia*; the Guiana Cedar is *Iciba altissima*; the Japan Cedar, a *Cryptomeria*; White Cedar, species of *Cupressus*, *Melia*, and *Bignonia*.

CEDAR-BIRD. See WAXWING.

CEDRELEÆ is a tribe of plants belonging to the order MELIACEÆ. The species are timber-trees; the timber is usually compact, scented, and beautifully veined. The tribe is distinguished by the stamens being free and inserted outside at the base of the disc; the cells of the ovary have several ovules; the capsules have from three to five valves, opening from the top, and breaking away from the axis; the seeds are several, compressed.

Cedrela Toona (Bastard Cedar) is a valuable species, a native of the East Indies, where it is called Toon. The bark is a powerful astringent, and is said to be a good substitute for Peruvian bark in the cure of periodic diseases, and in the various forms of fever, dysentery, diarrhoea, &c. The wood, called Indian Mahogany, is capable of a high polish, durable, and not subject to warp; it is lighter than mahogany, and not so close in grain, but still it is valuable for furniture. In Assam boats are made from it. The tree is about 60 feet high, with small, white, fragrant flowers, which are used in Mysore for dyeing cotton a beautiful red.

Cedrela odorata (the West Indian or Sweet scented Barbadoes Cedar) is a valuable timber-tree. The wood is a reddish brown, with a pleasant smell, and is used for wainscoting rooms, for chests, and the inside work of clothes-presses, as the odour keeps out vermin. Canoes are made from the hollowed trunks. A disagreeable smell is given out from the leaves, bark, and flowers.

An essential oil called Wood Oil is found on *Chloroxylon Swietenia*, a species belonging to the tribe, which is a native of the East Indies. The wood is of a deep-yellow colour, and called Satin Wood, remarkably close grained, heavy, and durable, and comes nearer to boxwood than the produce of any other tree. *Flindersia* possesses a volatile oil. *Flindersia australis* is a native of Australia, and its wood is said to be not inferior to mahogany. *Flindersia amboinensis* is a native of the islands of Hiu and Ceram. The spiny part of the fruit is formed into rasps. See MAHOGANY.

CED'RINET, a peculiar substance obtained from the lighter oil of hard-wood tar; it is a liquid, but may be crystallized into red, slender, inflammable crystals.

CEDRON. See JERUSALEM.

CELASTRINEÆ, an order of POLYPERALÆ, consisting of shrubs and trees principally found in temperate latitudes, and not abounding in either the colder or the hotter parts of the world. *Euonymus* (the Spindle-tree) is the commonest European form of this order. The order differs from others of the cohort Celastrales in having a small, imbricate calyx; the petals imbricate in bud, afterwards spreading; and the stamens alternate with the petals. The order is divided into two tribes—*Celastræ* and *Hippocrateæ*. In the former there are four or five sepals and petals, four or five stamens inserted at or below the margin of a conspicuous disc, and albuminous seeds. The following are the principal genera:—*Euonymus* (the SPINDLE-TREE), *Catha* (KÂR), *Celastrus* (the STAFF TREE), and *Eleodendron*.

The second tribe, *Hippocrateæ*, is distinguished by having five sepals and petals, three stamens inserted in the face of the disc, with flattened filaments, and exalbuminous

seeds. Some of the species of the genera *Hippocrateæ* and *Salacia* have edible fruits.

CELEBES, a large island in the Eastern seas, lying between $1^{\circ} 40' N.$ lat., and $5^{\circ} 45' S.$ lat., and extending from 119° to $125^{\circ} E.$ lon. Its length from N. to S. is about 500 miles. The area has been estimated at 70,000 square miles, and the entire population at nearly 2,000,000. Three deep bays on the east and south break up those sides of the island into four large peninsulas. The western side is separated from Borneo by the Strait of Macassar, and it is bounded on the eastern by the Strait of Molucca. The centre of the island is a mountainous region, from which the four peninsulas branch out and terminate in promontories. Many of the mountains attain a considerable height, especially in the most eastern part of the northern peninsula, in the confederation of Manado, where the most important summit is that of Klabat, which is 6560 feet in height. Several of the mountains here are still active volcanoes, and hot springs, mud fountains, and geysers frequently occur.

The three bays are called Bony Gulf (or sometimes Sewa Bay), Tolo Gulf, and Tomini Gulf. There are three considerable rivers, of which the largest, the Chimana, rises in the Wajo country, crosses the kingdom of Bony, and discharges itself, by several mouths, into the Gulf of Bony. Ships of 300 or 400 tons burden can ascend this river for a considerable distance. Besides the three rivers there are numerous small streams.

The absence of extensive deltas, and the intervention of broad grassy plains between the forests, distinguish the Celebes from the other larger islands of the Malay Archipelago. It abounds in lakes, of which the most important is the Tampuang-Labaya or Tempe, in the south-eastern peninsula, in the most picturesque and varied scenery, and in the most beautiful and magnificent tropical vegetation.

Though cut by the equator, and wholly under the torrid zone, Celebes is considered healthy, the natives often enjoying a vigorous old age, and Europeans living longer than anywhere else in the East. Its extreme heats are tempered by the sea breezes, by monthly rains, and by the north winds that prevail for part of the year. The soil generally consists of a bed of vegetable mould, from 10 to 20 feet thick, lying on decomposing basalt. Gold is found in all the valleys of the northern peninsula, which is often convulsed by earthquakes, and abounds in sulphur. Copper of good quality occurs at various points, and in Macassar tin also, as pure as that of Banca.

The island is entirely destitute of the large carnivorous animals and pachyderms. Deer and wild hogs abound, together with the babayoussa and herds of antelopes. Poisoned animals, unknown in the Sunda Islands, here first occur; and the chameleon and flying-dragon, one of the samlan tribe, are numerous. Monkeys, moles, rats, field-mice, and scorpions are kept down by the numerous snakes of the island, from the enormous tiger-pythen (*Boa castanea*), 50 feet long, but not venomous, to the small but deadly *cobra di capello*, more dreaded than the crocodile. Among domesticated animals are found some small but vigorous horses, buffaloes, goats, sheep resembling those of the Cape of Good Hope, and pigs.

Dense woods clothe the mountain sides; and in these are found the oak, teak, cedar, and upas trees; together with countless others, useful or precious, the clove and nutmeg trees, the sugar and other palms, which supply the natives with coverings for their houses, clothing, cordage, household vessels, oils, and intoxicating drink. Among cultivated plants are—the coffee-tree, indigo, cacao, sugarcane, the manioc root, benzoin, and tobacco. Mountain rice is that chiefly grown, and also maize.

The Dutch divide the island into the three residencies of Celebes, Manado, and Ternate for governmental purposes. The residency of Celebes includes that part of the

island which has been longest held by the Dutch, and is made up of the states surrounding the Gulf of Bony. The finest harbour in the archipelago, that of Polean Rumbia, is possessed by this residency. The country around the Gulf of Gorontalo forms the residency of Manado. A part of the country round the Gulf of Tolo, together with a considerable portion of the Moluccas, are included in the residency of Ternate. The Dutch have been most successful in their administration of the residency of Manado. Under their rule the advances made here in education, material prosperity, and civilization have been extraordinary.

The oldest inhabitants are doubtless the Alfories of the interior, that being the name generally applied to the mountain tribes that have been driven inwards by invaders. They are of middle stature, fairer in complexion than the Malays, and milder and more intelligent than the Alfories of other islands. But by far the finest race in Celebes is that of the Boogis, supposed to have come originally from Borneo. Like the Dyaks, they are remarkably handsome, physically resembling the Polynesians far more than the Malays; to which last, also, they are far superior in point of honesty, energy of character, and general conduct.

The island is said to have been discovered by the Portuguese in 1512. In 1609 the English endeavoured to gain a footing. It is not certain when first the Dutch arrived, but it is known that the East India Company of that country secured a control of the trade of the island of Buton in 1611.

The native princes to a certain extent now recognize the authority of the Dutch, who have had the supreme influence in Celebes ever since they expelled the Portuguese, in 1660, with the exception of the four years' occupation by the British, from 1812 to 1816. Much public respect is paid to women, and they occasionally reign as queens.

The principal Dutch settlement is at the south of the island, on the spot where formerly stood the native town of Macassar. It has been a free port since 1847.

CELERY (*Apium graveolens*) is a wild plant, one of the **UMBELLIFERÆ**, by no means uncommon in the marshes of England, especially near the sea. Of the two properties, narcotic and aromatic, of most umbelliferous plants, the former abounds when the plant grows wild in moist situations, but under the influence of cultivation, blanching, and a dry soil, the aromatic principle is developed at the expense of the other. Thus the wild celery of Lad reputation becomes the wholesome vegetable which is such a favourite.

Of garden celery there are many varieties, the best of which for salad is the Turkish, and for stewing, the Celeriac, or the turnip-rooted sort. For soups the seeds may be employed with as much advantage as the stems or leaves.

Celery is raised in beds from seeds sown from the end of March to the beginning of May, and requires a light, rich, well-drained soil. When the plants in the seed-bed are about 2 or 3 inches high, they are picked out into another bed, where they remain till they are 6 or 7 inches high; they are then transferred to trenches, in which they are placed in a row, and finally left. As they advance in size they are gradually and carefully earthed up, till at last the whole length of the stem under ground is sometimes as much as 4 feet. The value of celery depends essentially upon its growing rapidly, being kept well drained, and having a solid stalk to its leaves.

CELESTINE, a name assumed by five of the popes.

CELESTINE I., St. Celestine (423-432), was a relative of the Emperor Valentinian, is celebrated as having held the Council of Ephesus in 431, when the Nestorian heresy was condemned. His interest to Englishmen lies, however, more in the fact that he sent St. Patrick (Patricius) as a missionary to convert Ireland. Palladius at the same time went to Scotland. Celestine was a

vigorous persecutor of heretics, and for his services in this respect was suitably.

CELESTINE II., Guido Costello (1142-43), reigned only five months. He was a pupil of Abelard.

CELESTINE III., Giacinto Bolone Orsini (1191-98), whose tomb is in the Lateran, has great interest for Englishmen as the pope who was bold enough to excommunicate the Emperor Henry VI. for the continued imprisonment of the English king, Richard of the Lion Heart. He suffered so much from the incessant strife of the time that it was only almost by force that he was prevented from resigning the papacy.

CELESTINE IV., Goffredo Castiglioni (1211), reigned only a few days.

CELESTINE V., Pietro da Morone (1291), is the pope who excites the sympathy of moderns by his inflexible integrity in abandoning an office for which he was not fit, but who received only the contempt of his contemporaries—a contempt summed up by Dante in his withering line ("Inferno," iii. 60)—

"Che fece per viltate il gran rifiuto."

The sense is better given by a paraphrase than a translation—he is "the coward who abandoned his great post." Nevertheless, his virtues were so great in the eyes of the people, and the miracles wrought at his tomb so numerous, and to those of the Roman faith so indisputable, that Peter of Morone has been canonized, being thus the second sainted Pope Celestine. He was born near Naples in 1215, of a peasant family, and became at seventeen a Benedictine monk; but the rule being too easy he retired to a cave on Mount Morone, wherefore he is called Peter of Morone. Later he joined two others, and the three hermits lived near one another in caves among the Abruzzi, where he founded the order of the **CELESTINES**, the name being given to it later in honour of his papacy. Their name was at first "Moronites." His fame as a saintly ascetic was so great that the cardinals, being torn with dissensions and so equally divided that they could not elect a pope, raised him to the Holy See on 7th July, 1294, after he had resisted in every way, even to the extent of escaping from their hands and being brought back by force. He continued his hermit's practices even as pope, but made two decrees of the greatest moment. The first was a revival of ancient ordinance that the cardinals should be under lock and key when electing a pope; and the second was that it was lawful for a pope to abdicate. These decrees he made to prepare the way for "il gran rifiuto," which took place on 13th December of the same year as his election, 1294. The worldly cares of the papacy, his own ignorance, his want of all understanding of state affairs, and the shocks to which his inflexible virtue was hourly exposed, made him feel that he was doing harm to himself and to the church, and he had too great a sense of responsibility to allow others to usurp his sacred functions. He formally stated all this and more, and divesting himself publicly of every dignity he returned to his hermit's cell. His successor was the ambitious Boniface VIII., whose despotic fears could not suffer the poor monk to be at large, possibly able to be worked upon to resume his charge, or at all events casting a doubt upon the validity of his own election while he lived; since if, as was alleged, the pope was elected by the direct inspiration of the Holy Ghost, it might be (and indeed was) thought that Celestine's decree permitting abdication was no better than a blasphemy. The aged frightened man sought to fly in disguise, but was captured by his cruel successor and imprisoned in a castle in the malarious Campagna, where he lived only a few months. He died 19th May, 1296. It is not too severe a judgment on Boniface to say that his death was desired.

CELESTINE is the crystallized sulphate of strontia (SrSO_4). It is found in bright pearly, prismatic, or tabular

crystals of the rhombic system, which generally have a tinge of blue (hence the name, from Lat. *caelestis*, celestial). There are also massive columnar and fibrous varieties. Celestine is found in beds of sandstone or limestone, and is often associated with gypsum and rock salt. It has a hardness of from 3 to 3.5, and specific gravity of 4. It resembles barytes, but the red strontia flame is distinctive. Fine specimens occur in Sicily, associated with sulphur. In England it has been found in the new red marl near Bristol, at Calton Hill, Edinburgh, and at other places.

CELESTINES, ORDER OF, a monastic order instituted about 1254 by Pietro da Morone, afterwards Pope Celestine V., from whom they took the name of Celestines. It was a reform of the order of St. Bernard, and its members adopted the rule of St. Benedict and devoted themselves to religious meditation. It became a very rich order, both in Italy and France. In 1770, in consequence of an order from Louis XV., the Celestines of France held a general assembly, to consider some reforms insisted upon by the king. These they refused to adopt and preferred the secularization or suppression of their order, which was ultimately effected by Pius VI. in 1776-78. Some years afterwards Ferdinand IV. of Naples suppressed the Celestine convents in his kingdom.

CELIBACY (from the Latin *celibis*, unmarried) was practised from the idea that it was favourable to an intimate union with God, even before the time of Christ. The notion arose from the philosophy of a good and evil principle prevailing throughout the universe—the body being the seat of the latter and the prison of the soul, which was thought to be defiled by bodily enjoyments. In Christian times the doctrine of celibacy was vigorously preached by St. Anthony, about 300 A.D.; but although he succeeded in obtaining many converts, an attempt to authorize the doctrine at the Council of Nice, in 325, failed. It was enjoined to bishops only in 692, and it was not until 1073 that the clergy generally were compelled by Pope Gregory VII. to take a vow of celibacy, and to put away their wives if married before ordination. Both rules, however, were systematically evaded or openly resisted, and, so far from being effectual, only tended to increase the existing moral corruption. The profligacy of the clergy, alleged to be due to this law, was one of the causes of the Reformation.

When, at the Reformation, the Protestants all declared against celibacy, the subject was discussed in the Church of Rome at the Council of Trent, and the majority decided in favour of it. The four lower orders of the clergy were permitted to quit the profession and marry, but from subdeacon upwards they could not do so without permission from the pope.

The practice does not seem to have originated in the Roman Catholic Church. Among the ancient Egyptians the priesthood were obliged to preserve the most rigid chastity; the priestesses of Vesta, Juno, Diana, Minerva, &c., were pledged to perpetual virginity, and the priests of Cybele had to be eunuchs.

The Greek Church allows priests and deacons to marry before ordination and live in marriage after it, but they cannot be married a second time; and only a priest living in celibacy can be chosen as a bishop or patriarch.

CELL, the basis of all living bodies, whether animal or vegetable. It will be convenient to consider separately animal and vegetable cells.

CELLS IN ANIMAL PHYSIOLOGY. When Schleiden, shortly before the middle of this century, had proved the prime importance of the cell as the element of all vegetable structures, Schwann at once accepted the demonstration, and made it his work to study the cells of animal tissues. If we take the entire human body, for instance, and separate it into bones, cartilage, nerve-tissue, skin, and muscle, we yet find, on close microscopical examination,

that all these various tissues, as they exist in the grown man, are made up of cells; and if we trace their history we find they arose from cells. Continuing the researches before birth, we find that the number of cells in the embryo lessens and lessens as we proceed, until we actually arrive at one cell, an *ovum*, about $\frac{1}{16}$ of an inch in diameter, a mere tiny spherical mass of jelly-like matter which incloses a small spherical body, the germinal vesicle. From this ovum, then, the whole body is produced. The process can be observed and minutely studied in the ova of frogs. Here a little dimple is noticed soon after impregnation, extending until it forms a furrow, and finally separating the ovum by fission into two cells. Next a transverse fissure appears in the like way, at right angles to the first, and we have now four cells. Each of these cells undergoes fission till the so-called "mulberry mass" is produced, from which the embryo is gradually developed.

What is this wonderful cell which has such formative power? Vegetable cells are more or less spherical bodies, limited by a cell membrane, and inclosing a nucleus, which is made up generally of several nucleoli. But the very general absence of a cell-wall in animal cells makes it necessary to further limit the description of an animal cell. But, since the contents of a cell are much alike in plants and animals, this substance is named protoplasm, the physical basis of life, and with Huxley we may define a cell as a nucleated mass of protoplasm of microscopic size. [See PHOTOMICROM.] In the human body the cells range from the red blood cell, 3000 of which side by side would measure an inch, to the ganglion-cell, ten times as large. The history of the organism is also the history of each cell. It lives, grows, produces other cells by fission or by germination, and dies. In certain lowly animals, as the *AMEBA*, &c., whose whole body is one cell, no nucleus has been found as yet, but there seems sufficient reason for believing that the definition given above holds good throughout.

Although it has been found advisable to narrow the definition of the word cell till it excludes a cell-wall, still in nearly all cells the outer layer is firmer than the inner, and in many kinds of cell it becomes quite differentiated, both physically and chemically, and serves as a cell-wall or membrane. Of such are fat-cells, bile cells, &c., whose contents differ in every respect from their cell-walls. It is remarkable what a variety of juices the epithelium cells of the alimentary tract secrete from one common source—the blood. If cell membranes become thick they are called *capsules*, as cartilage-cell capsules, for instance. Recently Heintzmann has thrown doubt on the homogeneity of cell-contents, and his researches seem to tend towards proving the protoplasm of cells to be woven in a highly complex fibrillous network.

It is probable that the life of a cell is but short, and that the constant death of cells necessitates as constant reproduction, or the whole animal wastes. The mode of this reproduction has already been indicated. When a cell has done its work it decomposes, and its materials are anew worked up by the body, or it dries up, as the cells of the skin or the epithelium, and is removed by abrasion.

Animal cells are spherical or spheroidal if free, but if pressed upon they modify their shape according to the pressure. Thus "pavement epithelium," under the microscope, looks somewhat like the six-sided network of the honeycomb. The blood-cells or red blood-corpuscles are discoidal, having a central depression. The outer shells of the skin take the shape of flat, thin, horny plates or scales, and this also is the origin of NAILS and HAIRS. The epithelium of the intestine and many other inner parts has long cylindrical cells. Some surfaces have ciliated cells. Finally, there are the branched cells, closely resembling the *Amœba* in their irregular shape, with their feelers extended in all directions; such cells make up the

spinal cord, and interlock by their processes, as in the cornea of the eye. Cells are connected by an intercellular substance, varying from a scarcely traceable quantity in epithelium to the bulk of the tissue in cartilage. The colour of the iris of the eye, &c., depends on the presence of pigment cells, whose function is to secrete and store up coloured granules.

CELL, VEGETABLE. Every plant is either a single cell or is made up of aggregates of cells. The cell, in its active, growing form, is usually composed of an outer skin, known as the "cell-wall;" secondly, of a soft, albuminous lining, the "protoplasm;" and thirdly, in the interior, of a watery fluid, the "cell-sap." The protoplasm contains, almost always, a roundish, denser body, of a substance similar to itself, called the "nucleus." The cell-sap does not occur in the youngest cells, but as they grow it appears at first like drops in the substance of the protoplasm. As the cell grows the drops increase in number and size, till at length they coalesce, and the protoplasm becomes a mere lining. When wood and cork cells are fully formed the protoplasm is completely absorbed, and there remains a mass of cell-walls, filled either with water or air.

No growth of the cell-wall takes place without protoplasm, which, indeed, is the one essential element of the cell. In some cases, especially in the lower forms, the development of the cell begins with the formation of a protoplasmic body, which only after some time differentiates a cell-wall. The protoplasm is a mixture of albuminoids, water, a small amount of mineral matter, besides carbo-hydrates and fats. Its consistency varies with the contained water; it is not a true fluid, but is soft and extensible. In general, it has a granular appearance from the admixture of starch, oil, &c., bounded by a clear portion. The protoplasm in cells of *Vallisneria* and some other plants may be seen under the microscope to rotate along the cell-wall, and in many cases to circulate from the cell-wall along threads of protoplasm to or from the nucleus. A movement of translation takes place in spermatozooids and other cells destitute of a cell-wall, by means of fine lashing threads called "cilia," and also by an amœboid movement in the *Myxomycetes* ("Flowers of Tan"). In the protoplasm of various cells, and differentiated from it, there appear, (1) chlorophyll—bodies containing the green colouring matter which is so widely distributed in the vegetable kingdom; (2) crystalloids—portions of the protoplasm simulating the shapes of crystals, but with the edges and angles not clearly defined; (3) aleurone grains—rounded albuminoid bodies of small size; (4) grains of starch; and (5) true crystals of calcium oxalate, &c.

While the cell-wall is young it consists of a combination of cellulose, water, and ash (incombustible matter). Cellulose is the main constituent, cotton, for instance, being almost pure cellulose. It has the same chemical formula as starch ($C_6H_{10}O_5$), but, unlike it, is not coloured blue by iodine. The growth of the cell-wall is not uniform, so that variations occur in the form and size of cells, and also in thickness. The growth in thickness is localized, so that projections appear inside or outside, sometimes in the form of rings or spiral bands. As the cell-wall grows, chemical changes take place, combined with an alteration of physical properties; thus cell-walls become at length woody, corky, or mucilaginous.

New cells arise by the rearrangement of the protoplasm round a new centre, and the formation of a new cell-wall. Sachs distinguishes three principal types of cell-formation: (1) the renewal or rejuvenescence of a cell—i.e. the formation of one cell from the whole of the protoplasm of a cell already in existence; (2) the conjugation or coalescence of two or more protoplasmic bodies in the formation of a cell; (3) the multiplication of a cell by the formation of two or more protoplasmic bodies out of one.

Cell-tissues are formed by the repeated division of one or more mother-cells, the daughter-cells being in connection from the beginning. See TISSUES.

CELLINI, BENVENUTO, was born at Florence in 1500, and died there on 13th February, 1570. His life is a romance that will not bear abridgment, and as told by himself is one of the most curious and interesting biographies extant. It not only contains very full information respecting the life and professional pursuits of an extraordinary individual, and describes all ranks of persons with whom he was connected during a long and busy career, but furnishes a lively and no doubt tolerably accurate picture of the state of society during the greater part of the sixteenth century. He numbered among his patrons the pope (Clement VII.), the Grand-duke of Florence, and Francis I. of France; and he lived at one time or another in half the capitals of Europe. He always declared that it was by his hand that the great Constable de Bourbon fell. Cellini's vanity and self-satisfaction, displayed throughout the work, are excessive and diverting; and, candid or reckless, he does not disguise the excesses into which an ardent temperament and ungoverned passions too frequently urged him. To the dishonour of those who held the reins of government, and especially in the States of the Church, his narrative shows how easily crime was overlooked when the delinquent had talents (either useful or agreeable to his judges) to plead in his behalf, or courtly interest to protect him from the just consequences of a disregard of the laws. There are several translations of the "Vita" into English. Cellini also wrote a treatise on various branches of his art.

The works of Benvenuto Cellini may be divided into two classes. The first, for which he was most celebrated, comprises his smaller productions in metal, the embossed decorations of shields (such as the magnificent specimen at Windsor), cups, salvers, ornamented sword and dagger hilts, clasps, medals, and coins, in which he showed great skill in composition and excellence in the details of execution. The second includes his rare larger works as a sculptor; and a reference to his bronze group of Perseus, with the head of Medusa, in the Piazza della Signoria at Florence, will be sufficient to illustrate his merit in the higher walk of his art. He also executed some fine portraits. The splendid and exhaustive work of M. Plon, with etchings by Le Rat, (Paris, 1883), on Cellini and his works, is an honour to the century. It enumerates all the known works of the artist and all those attributed to him, and the principal ones are represented.

CELLULAR or **AREOLAR TISSUE**, in animal physiology, one of the CONNECTIVE TISSUES.

CELLULAR TISSUE, in vegetable physiology. See TISSUES, VEGETABLE.

CELLULOSE or **LIGNIN** ($C_6H_{10}O_5$). This substance forms the tissue of all plants. The pith of several trees and some seeds contain it quite pure, but it is generally found incrustated with foreign matters. Cotton, linen, and hemp, in their various forms, consist entirely of cellulose nearly pure. It is generally insoluble in acids and alkalis, and is only affected by the strong mineral acids. Strong sulphuric acid converts it into dextrine, and by long boiling with water into glucose. When unsized paper, which is cellulose nearly pure, is dipped into sulphuric acid slightly diluted with water, it undergoes a remarkable change, and becomes very tough; in this form it is known as vegetable parchment, or parchment paper, and is largely manufactured as a cheap and efficient substitute for parchment, which it much resembles, and which it replaces in most of its applications. Nitric acid converts cellulose into nitro-compounds, of which the most important is trinitro-cellulose, known as pyroxylin or gun-cotton. This substance is an important article of manufacture, and is enormously used as a powerful explosive, particularly for battering charges in war. Dissolved in ether and alcohol

it is known as collodion, so much used in photography. [See COLLODION.] The only known solvent of cellulose is an ammoniacal solution of oxide of copper, in which it is freely soluble; the cellulose is precipitated unchanged by hydrochloric acid.

CELOSIA, a genus of plants belonging to the order AMARANTACEÆ and division MONOCOTYLEDONÆ, comprehending the flowers which gardeners call cock-combs, on account of the crested, flattened appearance of their inflorescence. The flowers have a perianth of five narrow pieces, surrounded by three bracts of the same colour; five stamens united at the base into a cup, with two-celled anthers; a membranous one-celled capsule, opening by a transverse dehiscence, and containing two or three seeds.

Celosia cristata (the common cock-comb) and *Celosia coccinea* are both natives of the East Indies. The former came, however, most probably from Japan or China. Their height varies from 6 inches to 2 feet, and their colours from red to white.

Nothing can be more easy of cultivation than these flowers, and they are capable of being brought to an extraordinary size by good management.

CELSUS, AURELIUS CORNELIUS, an ancient Latin medical author, is of uncertain date, but appears to have lived in the Augustan age. He wrote treatises on agriculture, rhetoric, and military affairs, as well as a great work on medicine; but all have been lost except the latter and some fragments of his work on rhetoric. The work on medicine is exceedingly valuable in the history of the art, as Celsus was evidently a skilled practitioner; and the account given by him of the structure of the human body will not fail to surprise those who have been told that the ancients were ignorant of anatomy. A convenient edition of it is one edited by Dr. Milligan, (second edit. Edinburgh, 1831). Stegall's edition (London, 1837) has a good English translation.

CELT. See KELT.

CELTIBERI, a people of ancient Spain, extending from the right or S.W. bank of the Iberus (Ebro) towards the interior. The Celtiberi were a brave people, and they proved formidable both to the Carthaginians and the Romans. After the destruction of Numantia by Scipio Æmilianus, B.C. 133, they frequently revolted, but on the death of their leader Sertorius, in B.C. 72, they were finally subdued by Pompey.

CELTIS. See NUTTLE-TREE.

CELTS are implements of a peculiar shape that were used by the early races of man, and which are still used by some of the inhabitants of the South Sea Islands. The term has been differently used by antiquarians. Some apply it to all implements of this peculiar form, one end of which is chisel-shaped, whether of stone or metal; others restrict it to stone implements; while others again confine it to the Neolithic type of triangular-worked implements, having at one end a chisel edge and at the other a blunt point. These weapons were mounted in a wooden handle, somewhat like a hatchet or tomahawk.

CEMENT. This is a general term applied to any substance employed to make different articles adhere together. There are four varieties—stony, metallic, resinous, and glutinous. Mortar, solder, mastic, and glue illustrate these varieties, and the articles under these headings may be referred to. Portland cement is a mixture of lime and clay burned in certain proportions. A cement employed in jointing iron pipes is composed of iron borings and sulphur, damped with solution of sal-ammoniac. A cement, used for fixing pieces of glass while being ground for optical purposes, is made of resin, bees' wax, and whiting. Metal chasers often use a cement made of pitch, resin, tallow, and brickdust. A cement for alabaster or spar may be formed of resin, bees' wax, and plaster of Paris. For various purposes in the arts the following are used as cements:—

Shell-lac; caoutchouc; gutta-percha; melted sulphur; a mixture of lime and white of egg; a mixture of gum-arabic, gum-ammoniac, and alcohol; gum-ammoniac, isinglass, and alcohol; rice paste; china clay, pitch, red lead, white lead, and linseed-oil.

CEMENTS for building purposes are all prepared from carbonate of lime in some form, which is converted to the oxide "quicklime" or to the hydrate "slaked lime," and used as such, their subsequent hardening being dependent on either the reformation of the carbonate or the formation of silicates. Besides these there are what may be termed plasters, in which sulphate of lime is the essential constituent.

The cements in most common use may be conveniently separated into three divisions:—*Common mortar* is made from pure, rich, or fat limes, which, after calcining and slaking, are made into a paste and mixed with a certain proportion of sand. This substance hardens slowly in the air by the evaporation of the water and absorption of carbonic acid, forming carbonate of lime; it does not harden under water. The sand is a mere mechanical mixture, being added to save expense, increase resistance, and lessen shrinkage of the mortar while drying. The relative proportions of the lime and sand vary according to the richness of the lime; for general purposes one measure of lime mixed with from one and a half to two measures of sand is a fair proportion; very rich limes will bear more sand, and poor limes less. *Hydraulic mortar* is made similarly, but with hydraulic lime. It does not bear as much sand, but hardens slowly under water, partly by the formation of carbonate of lime, but chiefly by the formation of silicates of lime, iron, and alumina. Hydraulic limes are produced from limestones which contain from 10 to 30 per cent. of argillaceous matter; they slake slowly. *Hydraulic cements* are produced from limestones containing from 40 to 60 per cent. of argillaceous matter. They do not slake, but harden quickly under water. The stones are calcined, and the cement is kept quite dry in fine powder; it is generally used alone, without any admixture of sand, and only small quantities can be wetted at a time. The cement stones from which the cement is prepared are usually found where there are thin beds of limestone and clay. Roman cement is chiefly made from the septaria nodules found in the London, Oxford, and Kimmeridge clays; they are dredged up at Chichester Harbour, Harwich, off the Hampshire coast, and at Southend. Artificial cements are prepared by calcining rich limes in fine powder with the requisite proportion of fine argillaceous matter, as river mud. The most noted is Portland cement. *Pozzolanas* are certain substances containing silicates in excess, which, when mixed with fat limes, render them hydraulic, and produce an extremely hard mortar. Some such substances are brick or tile dust, iron scale, trass, basalt, &c.

CEMETERY, a place of burial other than a churchyard. The word has a tender meaning of its own; it is in Greek *koimeterion*, a sleeping-place, from *koimain*, to lull to sleep, of all names the most appropriate for the final resting-place. The Greeks avoided naming death, whence their poetical appellation for the homes of the dead. From a similar motive cemeteries in Persia are to this day called "cities of the silent."

The dangers to health of overcrowded churchyards brought about legislation enforcing the closing of such churchyards, and permitting the acquisition of cemeteries apart from the church. The cemeteries so acquired by parochial authorities, and many cemeteries the property of private companies, have usually in England a consecrated and an unconsecrated portion, the former being devoted exclusively to members of the Church of England. This unhappy distinction is not, of course, known in Scotland. Cemeteries are usually carefully planted with fine trees and shrubs, and very frequently contain handsome memorials of

the departed, which receive additional grace from their setting of verdure. Far from being gloomy places of sepulture, most cemeteries are thus converted into peaceful and hopeful resorts for not unhappy meditation. Every effort is made there, as with the funeral ceremonies of later days, to rob death of needless horror. This is the case not only in our own country but on the Continent, and the traveller often finds the pretty wooded spot on a hill-side or in some quiet corner which is the cemetery of the neighbourhood as attractive as anything in the towns he visits. Especially is this so when some celebrated name reminds him that one of England's illustrious children lies beneath his feet.

For the present law with respect to interments in England and Wales see BURIAL REGULATIONS.

CENCI, BEATRICE DI, a Roman lady of the sixteenth century, whose memory has been preserved by the legend of her extraordinary beauty and tragical fate. As narrated by the Italians, and as told by Shelley in his masterpiece of horror, the "Cenci" drama, her history runs thus:—She was the daughter of Count Francesco di Cenci, a man notorious for his debauchery and frightful wickedness. He had on various occasions purchased at an enormous price, from the Papal government, pardon for murder and other shocking crimes. He had married a second time, and had conceived an implacable hatred towards his children by his first wife, and is even charged with having put two of his sons to death. The remarkable beauty of his daughter Beatrice excited in the breast of the old villain "feelings at which nature shudders," and the gratification of his incestuous passion was aggravated by every circumstance of cruelty and violence. His unfortunate victim appealed to the pope, Clement VIII., but in vain; and her attempts to escape by flight having been frustrated, she sank into despair. At length she, with her step-mother and brother, unable longer to bear the ill-treatment and villainies of the count, conspired with his steward and several other persons to put their oppressor to death, which they accomplished by means of a hired assassin. Suspicion fell upon them, and they were all arrested, carried to Rome, and subjected to the most frightful tortures. Beatrice constantly asserted her innocence, but she was condemned to death along with her step-mother and two brothers. The most earnest entreaties for her pardon were made to the pope by the noblest families in Rome, but the pontiff was inexorable, and Beatrice was executed on the 11th September, 1599, with her step-mother and elder brother, the younger having been spared on account of his youth. The immense possessions of the family were confiscated by the pope.

Added to this moving tale, one of the best known and also one of the loveliest pictures in the world, a female portrait by Guido Reni, now in the Barberini Palace at Rome, is by universal consent and long tradition set down as that of Beatrice, painted by Guido in prison, as she sat on her pallet still in her nightgown, on the eve of her execution.

It is with unfeigned regret that a legend consecrated by so many poets and painters must now, at the stern bidding of Signor A. Bertolotti, director of the Italian state archives at Rome, be at once and for ever abandoned to the realm of almost pure romance. In his exhaustive monograph, "Francesco Cenci e la sua Famiglia" (second edition, Florence, 1879), he demolishes almost every palliating statement of the poetic story. The main facts he so conclusively proves may be baldly stated thus, the reader being referred to the book for irresistible detailed proof of these conclusions:—1. There is no proof whatever of the authenticity of the portrait, nor of its acquisition by the Barberini family. 2. It is an undoubted Guido, but it is equally certain that Guido never worked in Rome till 1608, and Beatrice was executed in 1599. 3. The tradition of the portrait extends no further back than the present century, so far as can be ascertained. 4. And finally, in two

picture, the "Aurora" (Rospigliosi) and the "Martyrdom of St. Andrew" in St. Gregory the Great's, Guido has used the same face, probably a favourite Roman model.

Turning to the story itself, still worse havoc is wrought by Signor Bertolotti. His discoveries show the following facts:—1. There is no authority for the charge of incest, so great a palliation of the crime. 2. Beatrice, far from being a persecuted saint, as in Shelley's drama, had an illegitimate child by her father's steward, who was dismissed for his crime. 3. Beatrice admittedly was treated with great cruelty, immured at Petrella in a living death, beaten with a stirrup leather, &c. It is not clear whether she or her step-mother devised the murder of the villainous Cenci; but it is quite clear that Beatrice drugged him with opium, and that her lover, the steward, murdered him. 4. Her brother Giacomo, with her connivance, murdered the steward to hide traces of the crime committed by him, and not till his confession and that of her step-mother did Beatrice, even though frightfully tortured several times, confess. Signor Bertolotti gets but scanty reward for a labour of immense research, since the legend has sunk deeply into the hearts of men.

CENIS, MONT, a summit of the Graian Alps, 11,000 feet in height, on the borders of Savoy and Piedmont. The Pass of Mont Cenis, one of the easiest, safest, and most frequented in the Alps, crosses the chain at the height of 6775 feet. It was constructed by Napoleon, at a cost of £300,000, and was opened in 1810. In 1867 a railway of peculiar construction, the invention of M. Fell, was laid upon the road and worked by locomotives; but it was removed when the French and Italian railways were connected by the Mont Cenis Tunnel. See *TRNELL*.

CEN'OTAPH (Gr. *kenos*, empty; *taphos*, a tomb), a monument erected for those whose bodies could not be found; for instance, those lost at sea. The name is now applied to a tomb built for a family during the lifetime of its members.

CEN'SER (short for *incenser*, Lat. *incendere*, to burn), a sacred vessel used for burning and wafting incense, i.e. burned spices. Censers were used in the Hebrew service of the Temple, but their exact form is not known. The censer or *thurible* (Lat. *thuris*, incense) employed in the Greek and Roman Catholic Churches is an ornamental dome-covered vase, attached to chains held in the hand, by which it is thrown into the air so as to waft the smoke of the burning incense in all directions.

CEN'SORS, at Rome, were first created B.C. 442. At first they were exclusively of the patrician order, the first plebeian elected being C. Marcius Rutilius (Liv. vii. 22). At that time the censorship lasted for five years, but a law was passed abridging its period of activity to a year and a half. Augustus performed the functions of the office, but refused the title. Under Tiberius the censorship was abolished. When one of the censors died the remaining colleague resigned, and two fresh censors were chosen. Their duties originally were taking the census, registering the citizens according to their different orders, and keeping the land-tax rolls. The rank of the citizens and the valuation of taxable property were at their disposal. They could exclude a senator from the senate-house, deprive an eque of his horse and rank, or remove a plebeian from his tribe.

The administration of the public revenues was a part of the business of the censors, and we find them not only establishing tolls and excise duties in subject towns, but actually fixing the price at which salt should be sold in Rome itself (Nieb. vol. ii. p. 400). They let to farm the customs and the contracts for public works. They superintended the roads and took care of the public books and documents. Cases of marriage and betrothal came under their inspection. Their acts were registered in public documents. There were also censors in many of the municipia and in the provinces (Cic. "In Verr." ii. 53).

The third and most important branch of their duties, and that which made this magistracy the most dreaded and revered in the Roman state, was the *Regimen Morum*, extending to the private lives of the citizens. If they punished a citizen, by excluding him from the rolls, they had to set down his offence against his name. They did not scruple to investigate the most secret affairs of any man. They punished by fine as well as by degradation of rank, but no doubt the public declaration of shame or guilt was the part of the punishment most dreaded.

CENSORSHIP OF THE PRESS, a regulation which has prevailed in most countries of Europe, and still prevails in many, according to which printed books, pamphlets, and newspapers are examined by persons appointed for the purpose, who are empowered to prevent publication if they see sufficient reason.

There are different modes of censorship—the universal previous censorship, by which all MSS. must be examined and approved of before they are sent to press; the indirect censorship, which examines works after they have been printed, and if it finds anything objectionable, stops their sale, and confiscates the edition, and marks out the author or editor for prosecution; the optional censorship, which allows an author to tender his MS. for examination in order to be discharged from all responsibility afterwards; and lastly, by a distinction which has been very commonly made between newspapers or pamphlets and works of a greater bulk, the censorship of the journals, which exists even in countries where larger works are free from this superintendence. All these forms of censorship necessitate an establishment of censors, examiners, inspectors, or licensers, as they have been variously called, appointed for the purpose—a provision quite distinct from the laws which define the various offences which a man may be guilty of by publication; these are repressive or penal laws, whilst the censorship, and especially the previous censorship, is essentially a preventive regulation.

The principle of a general censorship of the press has been maintained by the Church of Rome in all countries where it had power to enforce it. It was formally established as a duty of bishops, &c., by a bull of Leo X. in 1515. The Reformation greatly modified the censorship and reduced its powers, without, however, abolishing it; the power passed into other hands. In England the crown assumed the prerogative, and delegated it to the Archbishop of Canterbury and Bishop of London, with power to appoint deputies. In Elizabeth's time printing was altogether forbidden except at London, Oxford, and Cambridge, and the presses there were strictly limited. Marlowe's Ovid and many other works were burned by Archbishop Whitgift and Bishop Bancroft in 1599. Under Charles I. the Star Chamber limited the number of master printers in the kingdom to twenty, and of type-founders to four; and the cruel punishment and mutilation of Prynne and his fellow-martyrs for the liberty of the press, in 1637, must be in the memory of all. The ordinance of the Long Parliament in 1643, going almost on the same lines, drew forth from Milton that *Areopagitica* or plea "for the liberty of unlicensed printing," which is one of the glories of English prose literature. As Isocrates prayed the *Areopagus* of Athens, in a famous oration, to reform itself, so Milton prayed the Long Parliament; whence his title. His effort was in vain. The press was freer under Cromwell, but on the Restoration it was at once gagged by a formal statute, the Licensing Act, 1662, which endured till 1679, when the temper of the people was such that Charles II. dared not renew it. James II., in his obstinate way, re-enacted it in 1685, for seven years; but William III., after a short re-enactment, from 1692 to 1694, abandoned it altogether at the first serious opposition of the Commons, in 1695. Since then the law of libel, yearly becoming less stringent, and the stamp duty (which lasted from 1712 to 1855) have

been the only obstructions to the freedom of the press. The press in England may now be said to be absolutely free from all restraints but those common to every other occupation followed by her citizens. The censorship of the drama applies only to the representation of plays on the stage, not to their publication. It is vested in the lord chamberlain, and dates from 1737, when Sir Robert Walpole was provoked into passing it by a stinging personal burlesque of himself in a play of Fielding's, "The Historical Register." This censorship still continues.

CENSUS. At Rome, was a numbering of the Roman people and a valuation of their property. It was held in the Campus Martius, after the year B.C. 432. Every Roman citizen was obliged, upon oath, to give in a statement of his own name and age, and of the name and age of his wife, children, slaves, and freedmen, if he had any. The punishment for a false return was, that the individual's property should be confiscated, and he himself scourged and sold for a slave. Taxation depended on the results of the census, and was, in fact, its main object; many kinds of property were excepted, while, on the other hand, some sorts of property were assessed at several times their value. Constant changes were made by successive censuses in the valuation of taxable property. It appears from a passage in Livy (*vi.* 27) that the census also showed the amount of a man's debts and the names of his creditors.

The census was held at first by the kings, afterwards by the consuls, and from B.C. 442 by two magistrates, called Censors (*Censores*), who were appointed every five years. The census was not held with strict regularity. The usual interval, commonly called a lustrum (*lustrum*), was five years.

When a person was duly entered on the books of the censors, this was taken as a proof of his citizenship, even if he were a slave, provided he had been registered with his master's consent. As the census was held at Rome, citizens who were in the provinces, and wished to be registered, were obliged to repair there on that occasion; but this was sometimes evaded. The census, accompanied with the ceremony of the lustrum, a purificatory sacrifice, seems to have fallen into disuse after the time of Vespasian; but the numbering of the population and the registration of property continued throughout the period of the empire.

The nature of the Roman census may be collected from various particulars. One object was to ascertain the number of men capable of bearing arms; and another, to ascertain the amount of each person's property, and the various heads of which it consisted. Cicero's treatise on "Laws," though it contains a picture of an ideal republic, appears in one passage (*iii.* 3, 4) to describe what the Roman census was as it existed in his time. He says:—"Let the censors take a census of the ages of the people, the children, the slaves, the property; let them look after the temples of the city, the roads, waters, treasury, the taxes; let them distribute into tribes the parts of which the people consist; then let them distribute the population according to property, ages, classes; let them register the children of the cavalry and the infantry; let them forbid celibacy; let them regulate the morals of the people; let them drive no infamous man in the senate; let there be two censors; let them hold their office for five years; and let the consular authority be always continued. Let the censors faithfully guard the law; and let private persons bring to them their *acta*" (probably their vouchers or evidences). Thus the Romans must have had an immense mass of statistical documents, collected every five years, from which the population and the wealth of the community at each quinquennial period could be accurately known. Florus (*i.* 6) observes, that "by the great wisdom of King Servius the state was so ordered that all the differences of property, rank, age, occupations, and professions were registered, and thus a large state was administered with the same exactness as the smallest family."

CENSUS. Before the first enumeration of the people of this country, in 1801, the number of the population was a fruitful topic with party writers. By some it was contended that England was far less populous than it had been formerly. It is now known that the population of England increased upwards of 2,250,000 between 1750 and the end of the century; but it was not until a census was actually taken that an end was put to the disputes as to the amount of the population.

Having once obtained an enumeration of the people, it has been possible to apply the facts to anteeient periods, in order to form an approximate estimate of the amount of population. This task was undertaken by the late Mr. Rickman, who in 1836 addressed a circular letter to the clergy throughout England and Wales, asking for their assistance in preparing returns from the parish registers of the births, marriages, and deaths at different periods. Out of about 10,000 parishes in England, one-half possess registers which were commenced prior to 1600, and of these three-fourths commenced as early as the year 1570. From these registers Mr. Rickman was supplied with the number of births, marriages, and deaths for six periods, each embracing three consecutive years, from which he calculated the average population of each period. It was then assumed that the births, marriages, and deaths were in the same proportion to the population of each period as in 1801. The result of Mr. Rickman's estimate, according to his mode of calculation, showed that the population of England and Wales in each of the following years was—

	England.	Wales.
1570, . . .	3,737,811 ...	301,038
1600, . . .	4,460,451 ...	351,261
1630, . . .	5,225,263 ...	375,251
1670, . . .	5,395,185 ...	378,161
1700, . . .	5,653,061 ...	391,947
1750, . . .	6,066,011 ...	450,994

Census of 1801.—The first census of Great Britain was limited to the following objects—1, the number of individual inhabitants in each parish, distinguishing males from females; 2, the number of inhabited houses, and the number of families inhabiting the same in each parish; 3, the number of uninhabited houses; 4, a classification of the employment of individuals into the great divisions of agriculture, trade, manufacture, and handicraft, and a specification of the numbers not included in either of those divisions; 5, the number of persons serving in the regular army, the militia, and the embodied local militia. The inquiry under the fourth head entirely failed.

Census of 1811.—The second census embraced all the points which were the subject of inquiry in 1801; but the question respecting the number of houses was subdivided, so as to distinguish the number of houses building. With a view also of obtaining a more accurate return of the occupations of the people, the form of inquiry under this head was modified so as to ascertain, 1, what number of families (not persons, as in 1801) were chiefly employed in or maintained by agriculture; 2, how many by trade, manufactures, and handicraft; and 3, the number of families not comprised in either class. The heads of inquiry were the same in 1821 as in 1811, with an additional head respecting the ages of the population.

Census of 1831.—The new features in this census were an alteration in the form of inquiry respecting occupations. The absence of uniformity in describing occupations not inserted in the official formula, and the difficulty of testing the accuracy of that part of the classification which was left to the discretion of the overseers, were the principal defects of this plan.

In 1801 the attempt to ascertain the occupation of every individual was a failure, and the inquiry in 1811 and 1821 had reference only to the heads of families; but this

form was altered in consequence of "the often recurring doubt as to what is to be deemed a family." The returns to the questions, as modified under the census of 1831, showed, as in 1811 and 1821, the number of families employed in, 1, agriculture; 2, trade, manufacture, and handicrafts; and 3, the number of families not comprised in either class; but they also showed, in addition to the information procured at any former period, the number of *persons* (males aged twenty years and upwards) employed in, 1, manufacture, or in making manufacturing machinery; 2, retail trade or handicraft, as masters or workmen; 3, the number of capitalists, bankers, and other educated men; 4, labourers employed in non-agricultural labour; 5, other males aged twenty years and upwards (not including servants); 6, male servants aged twenty and upwards; and also male servants under twenty. The number of female servants was also returned under a separate head. The returns also showed, in reference to the occupation of the land, the number of, 1, occupiers employing labourers; 2, occupiers not employing labourers; and 3, labourers.

Census of 1841.—In this census the heads of inquiry were more numerous and more minute, while the results obtained were more accurate than in any preceding one, two very important improvements being made as to the inquiry respecting ages and occupations. Instead of quinquennial and decennial periods being taken, as in 1821, or only the age of males aged twenty and upwards, as in 1831, the exact age of every person was ascertained. In reference to occupations, the enumerators were directed to ascertain the employment of every person, distinguishing sex, and whether above or under twenty years of age. A new head of inquiry was also introduced for the purpose of showing the number of persons born in the county in which they resided; the number born in other counties of the same country; and the number born in Scotland, Ireland, the colonies, and in foreign parts.

Census of 1851.—On this occasion it was resolved to exhibit not merely the statistics, as before, of parishes, and more completely of parliamentary and municipal boroughs, but also of such other large towns in England and Scotland as appeared sufficiently important for separate mention, and of all the ecclesiastical districts and new ecclesiastical parishes which had been created in England and Wales during the previous forty years. In addition also to the inquiry concerning the age and birthplace of the population, it was determined to ascertain the various relationships (such as husband, wife, son, daughter), the civil condition (as married, unmarried, widower, or widow), and the number of persons blind, deaf, and dumb. But the most novel feature in this census was the attempt to supply the statistics of the ecclesiastical and educational condition of the country. It stated the amount of church accommodation at the command of each religious denomination, and a return was procured of those in attendance at the several churches on Sunday, 30th March (the day previous to that on which the census was taken). The attendance throughout thirty-five religious communities in England on that forenoon was returned as 4,428,338, of which the proportion assigned to the establishment was 2,371,732. The returns for Scotland, admittedly very imperfect, gave a total of 943,951, of which 351,451 belonged to the establishment.

But the fact brought out with most startling prominence in this census was the remarkable decrease in the population of Ireland. As will be seen by the annexed tables, up to 1841 there had been a steady increase, as in other parts of the United Kingdom; but in 1851 it was found that the work of the previous twenty years had been more than undone. The decrease was very general—only two or three towns in Ulster being excepted—and was, of course, mainly owing to the disastrous famine of 1845-47, and the vast amount of emigration consequent thereon.

Census of 1861, 1871, and 1881.—On these occasions all the improvements of the previous censuses were made available, except taking the attendance at the different places of worship, but no additional features of special interest were introduced. In 1861 it was originally intended to obtain the number belonging to each religious denomination, by a special question to that effect in the census paper, but the opposition of the dissenters to this proposal was so great that the idea had to be abandoned. Their main objection to the plan was that it would give an unfair advantage to the established church, for they alleged that the large proportion of that numerous class who in reality belong to no denomination at all would, for various causes, return themselves as attached to the church. When the Acts were being passed for taking the censuses of 1871 and 1881 further attempts were made to procure a return of the religion of the people in Great Britain as well as in Ireland (where no difficulty has ever been felt in the matter); but they again failed, chiefly for the reasons stated.

In the Scotch census for 1881 an attempt was made for the first time to give an accurate account of the numbers of the population in each locality who are said to be "Gaelic-speaking," or to be in the habit of making use of the Gaelic language.

Census of the whole British Empire.—It had been contemplated before, but 1871 was the first time that a census was taken of the British Empire. The imperial census was not the work of one, but of several departments, and it was not executed on one plan, but on plans and by methods suitable to the circumstances of the people. Where uniformity was practicable it was aimed at, and in the United Kingdom attained in all essential particulars. Even in England the first census only dates from 1801—confined to an enumeration of the inhabitants, and a few particulars respecting them; it is questionable whether a census could have been taken so elaborate as that of the United Kingdom for the year 1871. How much more difficult must the enumeration be of various races, speaking diverse languages, all free, and living under different forms of local administration? These difficulties were, however, overcome to a great extent, and wherever possible the people were enumerated. Upon summing up the final figures, it was found that the population of the empire in the year 1881 was 231,762,593; but subsequent examination of the census returns of India showed that the number had been largely understated. At the census of 1881 the number returned for India was 253,891,821, and in the latter year the entire British Empire contained a total population of 290,000,000. This population was living upon 7,769,119 square miles of territory, comprising in the two hemispheres these central islands, the surrounding islands in the British seas, parts of Europe, America, Africa, Asia, and Australasia. The dwelling-places of the people of the empire were also for the most part enumerated, and the number of the houses inhabited was about 45,000,000. (The word "house" here includes palaces, mansions, common houses, huts, and tents.) Houses are sometimes scattered wide over the land, but they are generally, under the influence of the social instinct, grouped together in villages, towns, or cities, with some political organization, the number necessarily varying with the definition of town or city; but, taking the words as they are generally understood in England, in the colonies, and in India, the number of towns and cities in the empire exceeds 2200. Many of them are great cities, and the metropolis of the empire, within its natural circular limits of a 12 miles' radius, has 3,814,571 inhabitants, or more than the aggregate of nineteen of the next largest towns of the empire.

The following table shows the population enumerated in England and Wales, Scotland, Ireland, and the islands of the British seas, at each of the censuses, 1801-81, with

the increase or decrease in each of the decennial periods; also the number of families and of inhabited houses, the average number of persons in each family, and other particulars so far as they can be given:—

	POPULATION.					FAMILIES AND HOUSES.				
	Number of Males.	Number of Females.	Total Population.	Decennial Increase.	Percentage of Decennial Increase.	Number of Families.	Persons in each Family.	Number of Inhabited Houses.	Persons to each House.	Families in each House.
ENGLAND & WALES.										
1801, March 10	4,254,735	4,637,801	8,892,536	...	...	1,896,723	4.698	1,575,023	5.643	1.204
1811, May 27	4,873,605	5,290,651	10,164,256	1,271,720	14	2,142,147	4.745	1,797,504	5.655	1.192
1821, May 28	5,850,319	6,149,917	12,000,236	1,835,980	18	2,493,423	4.813	2,088,156	5.747	1.194
1831, May 29	6,771,196	7,125,901	13,896,797	1,896,561	16	2,911,874	4.772	2,481,544	5.680	1.173
1841, June 7	7,777,566	8,136,562	15,914,148	2,017,351	14	...	...	2,943,945	5.408	...
1851, March 31	8,751,225	9,146,384	17,927,609	2,013,461	13	3,712,290	4.827	3,278,039	5.469	1.133
1861, April 8	9,776,339	10,289,965	20,066,224	2,138,615	12	4,491,524	4.47	3,739,505	5.358	1.20
1871, April 3	11,058,934	11,653,332	22,712,266	2,646,042	13.19	5,049,016	4.50	4,256,117	5.3	1.18
1881, April 1	12,689,902	13,334,537	25,974,439	3,262,173	14.34	5,643,353	4.6	4,833,811	5.37	1.17
IRELAND.										
1801, March 10	739,091	863,929	1,603,020	...	...	304,079	4.418	291,553	5.461	1.236
1811, May 17	829,296	979,598	1,808,894	197,444	12.27	402,068	4.191	301,093	5.939	1.322
1821, May 28	982,623	1,108,898	2,091,521	285,657	15.82	447,960	4.669	341,474	6.125	1.312
1831, May 29	1,114,456	1,249,930	2,364,386	272,865	13.04	502,301	4.707	369,393	6.401	1.360
1841, June 7	1,211,862	1,378,322	2,590,184	258,798	10.82	550,428	4.760	502,852	5.211	1.095
1851, March 31	1,375,479	1,513,263	2,888,742	298,558	10.25	600,038	4.814	370,388	7.801	1.621
1861, April 8	1,449,848	1,612,116	3,062,294	173,532	6.00	678,584	4.508	303,220	7.781	1.726
1871, April 3	1,693,143	1,756,875	3,450,018	267,724	9.72	740,748	4.50	412,185	8.15	1.29
1881, April 1	1,739,475	1,936,968	3,735,573	375,555	11.18	812,712	4.60	739,065	5.05	1.10
ISLANDS IN THE BRITISH SEAS.										
1821, May 28	3,341,926	3,459,901	6,801,827	...	...	1,312,032	5.184	1,142,692	5.595	1.148
1831, May 29	3,794,880	3,972,921	7,767,801	965,571	14.19	1,385,066	5.608	1,249,816	6.214	1.108
1841, June 7	4,017,576	4,155,518	8,173,124	407,723	5.25	1,472,787	5.550	1,328,839	6.152	1.108
1851, March 31	3,190,630	3,361,755	6,552,385	1,600,816	19.58	1,204,319	5.428	1,046,223	6.262	1.154
1861, April 8	2,801,961	2,959,582	5,761,543	177,511	11.79	1,128,300	5.105	995,156	5.804	1.137
1871, April 3	2,639,753	2,772,624	5,412,377	396,500	16.83	1,071,491	5.04	960,352	5.63	1.11
1881, April 1	2,922,801	2,957,735	5,150,536	252,538	4.7	994,579	5.18	912,761	5.65	1.03

* In 1811 the number of families in England and Wales was not correctly returned.

† Decrease in Ireland.

(*Census Returns, 1883*; "Birthplaces of the People and Laws of Migration," by E. G. Ravenstein, London, 1876.)

CENT and **CENTIME** (Lat. *centesimus*, a hundredth), names given to small coins, which represent respectively the hundredth part of a dollar (American) and a franc (French) and a *lilina*.

CENTAUR (that is, bull-killer), supposed to have sprung from the amour between Ixion and the cloud which he mistook for Juno. By some Magnesian mares Centaur propagated the race of half-men half-horses, usually called, for shortness, Centaurs, but more properly Hippocentaurs, or Horse-centaurs. The battle of the Centaurs and the Lapithæ forms the subject of the metopes of the Parthenon, part of which are now in the British Museum; and also one of the two subjects represented on the Phigælean frieze, which is also in the British Museum. Chiron was the wisest of the Centaurs, and was the pupil of Apollo and Artemis in hunting, medicine, music, &c. In his turn he taught the great heroes Peleus, and more especially his son Achilles, Dardæus, &c. His friend Hercules shot him by accident with a poisoned arrow, and Zeus thereafter placed him as the constellation **CENTAURUS** among the stars. The origin of this myth is evident; it arose in Thessaly, a horse-breeding country, and like the aboriginal Americans, who thought the Spanish cavaliers and their horses to be one animal, so probably did the ancient Hellenes dwelling on the plains with regard to the bold riders and hunters of Thessaly. This also explains the name itself, "bull-killer," otherwise inexplicable.

CENTAURUS (the Centaur), a southern constellation, a very small part of which rises in our latitude. It is situated under Virgo and Libra, and is evidently connected with **LYRUS**. It will be found in the **PLATE CONSTELLATIONS** (S. Hemisphere), midway between the figures XII-

XIV. and the pole. Originally this was one of the finest constellations in the heavens, but modern astronomers have made the celebrated **SOUTHERN CROSS** out of four of its most brilliant stars and some others. The splendid stars, Alpha and Beta Centauri, are respectively the third and the twelfth brightest stars in the sky. The first is additionally remarkable as being one of the few stars giving a parallax. It is a double star, and the total swing of the earth in her orbit shows a parallactic displacement between the stars, as seen at six months' interval, of one second (or $\frac{1}{3600}$ of a degree). Henderson first discovered this, and Maclear, with better instruments, confirmed it. By computation, this parallax gives the distance of Alpha Centauri from our earth as twenty billions of miles.

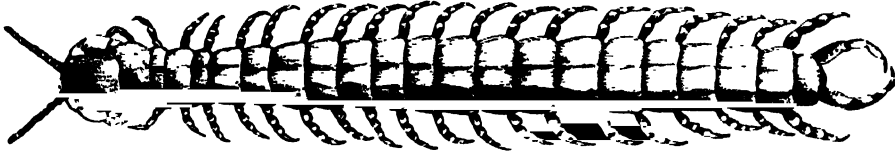
CENTIGRADE THERMOMETER, that which divides the interval between the freezing and boiling point into 100 degrees. Thus 100 degrees Centigrade are equivalent to 180 degrees Fahrenheit. See **THERMOMETER**.

CENTIPEDES is the general name applied to the Chilopoda, an order of the class MYRIPODA. In this order the body is composed of numerous segments, each bearing a pair of legs. The last pair of legs are much longer and stronger than the rest, and are directed backwards, so as to resemble a couple of pointed tails. The first two pair of legs are modified to form the organs of the mouth, the second pair being perforated for the discharge of a poisonous secretion. The segments of the body vary in number from sixteen to over a hundred; they are formed by flattened horny dorsal and ventral plates. There are two long tapering antennæ, composed of fourteen or more joints. The eyes are generally numerous, consisting of a number of ocelli; they are altogether wanting in the family Geophilidæ. The genus *Scutigera* has a pair of large compound eyes.

Centipedes are found all over the world, but it is in the tropics that they attain their greatest development. They run very fast, and shun the light, living for the most part under logs of wood and the loose bark of decayed trees. Their venomous properties cause them to be much dreaded in the hot climates which they inhabit.

The largest and most formidable of the centipedes are to be found in the genus *Scolopendra*. The species figured, *Scolopendra gigas* is of a reddish-chestnut colour, meas-

uring from 10 to 13 inches in length; it is a South American species. About forty species of this family are known, inhabiting India and the adjacent islands, Africa, America, and Europe. *Scolopendra ringulata*, $3\frac{1}{2}$ inches in length, is found in France, and elsewhere in the south of Europe. *Lithobius forficatus* is the commonest British species; it is about 2 inches long, and of a shining reddish colour; it is quite harmless. In the family Geophilidae the eyes are entirely wanting, and the body is extremely long and



Scolopendra Gigas.

slender, many species attaining a great length. *Geophilus xanthinus* is 6 inches long, of a narrow tape-like form, and of a reddish-yellow colour; it is furnished with 162 pair of legs. Another species, *Geophilus cunningii*, is 5 inches long, and contains 160 segments. Some species of the genus *Geophilus* are found in England, one of which, *Geophilus longicornis*, is 3 inches in length, and has fifty-five pair of legs. Like many other species of the same family, it is luminous in the dark. The genus *Scutigera* is remarkable for the possession of compound eyes, and the great length of their limbs and antennæ.

CENTRAL AMERICA comprehends the countries which, under the dominion of Spain, were known by the name of the kingdom of Guatemala. In the natural division of the American continent, the term Central America would comprise the whole territory lying between the Isthmus of Tehuantepec and that of Darien, but it is politically limited to the central portion of the long isthmus which unites North and South America, and extends from 7° to 18° N. lat., and from 82° to 91° W. lon. Its greatest length, from S.E. to N.W., may be about 1000 miles; its breadth varies from 30 to 300 miles.

It is bounded N.W. by Yucatan and Chiapas, W. and S. by the Pacific, and E. by the Granadian Confederation and the Caribbean Sea. It is divided into six states, of which Guatemala, San Salvador, Honduras, Nicaragua, and Costa Rica are independent republics, and the remaining state, British Honduras or Belize, is a British colony. These taken together cover an area estimated at 188,000 square miles. Between $10^{\circ} 30'$ and 13° N. lat. extends the plain of Nicaragua, which is about 175 miles long from south to north, and nearly as much from east to west. It is very little elevated above the sea, the Lake Nicaragua, which covers a considerable portion of it, being only 131 feet above the Pacific. It is separated from the Pacific by a range of low volcanic hills, very few of which rise to more than 700 feet above the sea. The country which lies east of this plain is intersected by many ridges of hills, running east and west, some having peaks from 7000 to 8000 feet high. Near the Gulf of Honduras the country is mostly low, there being a complete gap in the mountains between Ulua and Goascoran. The Isthmus of Chiquimula extends from the mountains between Omoa and the mouth of the Rio Montagua to the innermost corner of the Gulf of Honduras, and on the Pacific from the harbour of Acajutla to the mouth of the Rio Esclaves; there is a hilly district in the middle of this isthmus. The table-land of Guatemala occupies all the countries between the Isthmus of Chiquimula and that of Tehuantepec in Mexico; the high land in the interior of the peninsula of Yucatan forms its north-eastern projection. It largely consists of undulating plains, and, as its name signifies, has many magnificent forests. Some portions of this table-land exceed 5000

feet in height, and its surface is in many parts traversed by ranges of hills. It descends very rapidly towards the Pacific, but more gradually towards Mexico and the Atlantic. There are two volcanic mountains, the Volcano de Agna and the Volcano de Fuego, each of which exceeds 12,000 feet in height.

Owing to the physical character of Central America and the narrowness of the space from ocean to ocean, there are no rivers of any great magnitude. The chief are the San Juan and the Rio Dulce. The San Juan falls into the Caribbean Sea, near 11° N. lat. It is the channel by which the Lake Nicaragua discharges its waters into the Caribbean Sea. This lake is an inland sea, of a lengthened form, being about 120 miles long and 10 broad where widest, without narrowing much at either end. Its circuit is nearly 400 miles. It is deep enough to be navigated by vessels of considerable size. It is only very shallow along the north-east shore for a mile and upwards into the lake. It contains several islands. The river issues from the S.E. corner of the lake, and in its progress towards the sea receives the San Carlos and the Saniquiri. The river between the Caribbean Sea and the lake is too much impeded by rapids to be favourable to navigation; and it has therefore been proposed to cut a canal across the country for 60 miles, from the San Juan to the lake. If this were done, it might form part of a canal to connect the two oceans, for the lake at one spot is only 20 miles from the Pacific. See PANAMA.

The most important river of Central America is the Rio Dulce, the channel by which the Golfo Dulce discharges its waters into the Gulf of Honduras, $15^{\circ} 25'$ N. lat. The Golfo Dulce is a fresh-water lake, about 50 miles in circuit. The Lake Peten, near Yucatan, is 70 miles in circuit, and contains many islands. The Lake Atitlan, 80 miles from Guatemala, is about 50 miles in circuit, and is very deep. The Lake Guixar, near San Salvador, is 80 miles in circuit. Near the sea are many shallow lagoons, separated from it by strips of coast. There is a geyser, or boiling fountain, near Quesaltenango.

The objects of agriculture differ considerably according to the difference in the elevation of the soil. Wheat is grown almost exclusively in the most elevated districts of the table-land of Guatemala, and also in some districts in the hilly country. Barley, potatoes, and several European vegetables and fruits also grow there. Where the table-land does not rise much above 5000 feet, nor sink below 4000, as in the neighbourhood of the town of Guatemala, there are extensive plantations of nopal trees for rearing the cochineal insect. At lower levels, indigo, cotton, sugar, tobacco, cacao, rice, maize, sesamum, mandiocca, bananas, capsicums, pine apples, and oranges are cultivated.

Of mineral produce, gold, silver, copper, and iron are found in the hilly districts, and some mines are worked.

Jasper and marble also occur. Brimstone of good quality is collected in the neighbourhood of certain volcanoes on the table-land, and salt is made along the Pacific, west of 90° W. lon.

The population of Central America consists of aboriginal tribes, of the descendants of Europeans, and of the mixed race or off-spring of Europeans and Indians. The whites are the descendants of the Spaniards, who have settled in this country since its conquest in 1521. The mixed race, in other parts of America known under the name of *Mulattos*, are called in Central America *Ladinos*. Though the population generally are converted to Roman Catholicism and speak the Spanish language, some of the Indians in the secluded mountain districts adhere to ancestral forms of idolatry and retain their native dialect.

CENTRAL CRIMINAL COURT. This is a court established in 1831, by 4 & 5 Will. IV. c. 36, for the trial of treasons, murders, felonies, and misdemeanours committed within the city of London and county of Middlesex, and parts of Essex, Kent, and Surrey, and on the high seas. It is the most important criminal court in the kingdom. Under certain special circumstances cases may also be brought here from other counties, as was that of Palmer, the poisoner, from Stafford. The court is held at least twelve times a year, its sittings taking place in the courts-rooms adjoining the Newgate prison.

CENTRAL PROVINCES. The name given to the territory in British India under the administration of a chief commissioner, lying between 17° 50' and 21° 27' N. lat., and between 76° and 85° 15' E. lon., nearly coincident with the old geographical division of Gondwana. The area is 112,912 square miles, and the population in 1881 was 9,538,791.

The tract falls naturally into several distinct areas, marked out by their physical features, and in a great measure by geological structure. To the north extends the Vindhya table-land, which sheds its waters northwards into the valley of the Ganges. Throughout this region the surface is formed by the deposits styled Vindhyan, except in the large tracts where the Vindhyan strata are concealed by the overflowing volcanic rocks of the great Deccan trap area. South of Sagar (Saugor) and Damoh, in the valley of the Narbada (Nerbudda), come Mandla, which includes the upper course of the river before it descends into the plains, Jabalpur (Jubbulpore), Narsingpur, Hoshangabad, and a part of Nimar (the rest of which lies in the valley of the Tapi). This area chiefly consists of alluvial and tertiary deposits, with a narrow belt of older rocks along the southern side of the valley. Continuing southwards, the next cluster of districts comprises Betul, Chhindwara, Seoni, and Balaghat, which occupy the extensive highlands constituting the Satpura table-land, in great part formed of the Deccan traps resting upon crystalline rocks, or upon sandstone and other rocks of later date. These districts at their central plateaus attain a height of about 2000 feet. Still further to the south extends the great Nagpur plain, formed by the valley of the Wardha and Wainganga, which comprises the districts of Nagpur, Wardha, Bhandara, and Chanda. This region has no great elevation. It rests principally on granitic and trap-rocks, the former predominating in Nagpur and Bhandara, the latter in Wardha, eastwards. Below the *ghats* lies the Chhatishgarh plain, a low expanse of red soil, containing the districts of Raipur and Bilaspur. In this division is also included the district of Sambalpur, a rugged and jungle country, composed of crystalline and metamorphic rocks. Last of all, to the extreme south, almost cut off by forests and wild semi-independent states, is a strip of territory, of varied geological structure, stretching along the left bank of the Godavari, styled the Upper Godavari district.

Thus a hill plateau is succeeded by a lowland plain,

and again a larger and loftier plateau by a larger plain, ending in a mass of hill and forest, which is probably the wildest part of the whole Indian peninsula. But even the comparatively level portions of this area are broken by isolated peaks and straggling hill ranges, and nowhere in India are the changes of soil and vegetation more rapid and marked than in the Narbada country.

The forests are not so important as might be expected. The greater part of the waste land is covered by scrub jungle, and produces but little valuable timber. Nature may have doomed the stony highlands to barrenness, but the improvidence of man has desolated many of the fertile tracts. Under the system of conservancy introduced in 1860 some progress has been made in arresting the course of destruction.

The large coal-fields which extend under various parts of the Central Provinces, and the excellence of the iron ores, gave rise to expectations which at present seem unlikely to be realized. For the most part, on analysis, the coal has proved of inferior quality. It contains neither sufficient fixed carbon for iron-smelting, nor combustible volatile gases to such an amount as to adapt it for generating steam.

Nearly every form of land tenure found in India exists in the Central Provinces. Besides the estates of feudatory and of non-feudatory chiefs, known as *zamindaris*, the succession to which follows the law of primogeniture, what is termed the *malguzari* tenure prevails most widely. The estate, whether the property of one or many owners, is managed by a single proprietor, and the land is chiefly held by cultivators whose rents are thrown into a common stock. The profits are divided, or the losses made up, in proportion to the respective shares of the different proprietors.

CENTRE (from the Gr. *κέντρον*, a short point). This word, by its successive introduction in one sense and another, has become a generic term for any point of a figure or solid body such that the whole of the figure or body might be collected into that point, without any alteration in some respect or other which is specified. It is, in fact, an average point, as the following detail will show:—

1. *Centre of Figure*.—If any number of points be situated in given positions with respect to a plane, A , their average perpendicular distance from the plane is common to all the points of a second plane B , parallel to A . If two other planes, A' and A'' , be taken, and if B' and B'' be planes distant from them by the average distances of the points, then B , B' , and B'' will meet in a point which is obviously distant from the three planes by the several average distances of the points; and it is proved, by the application of algebra, that the point thus determined is also distant from any other plane whatsoever by the average distance of the points—whence it may be called the centre of figure of the points. It is usual to call it the centre of gravity, which it is on one particular supposition only—namely, that the points are supposed to have equal weights.

2. *Centre of Gravity*.—This is the point at which, the weight of the body being collected, the equilibrium of the body and of the system, if any, of which it forms a part, will not be disturbed. The centre of gravity of two bodies is that imaginary point at which, if they were joined by a bar, that bar could be suspended like a pair of scales, and equilibrium attained. In moving bodies (say the sun and the earth) the centre of gravity is also the centre of motion—the large body revolving round it in a small circle, and the smaller body revolving round the same point in a large circle. The centre of gravity of several figures can be easily determined as follows:—Triangle, $\frac{1}{3}$ from the base of the line drawn from the vertex bisecting the base; parabola, $\frac{3}{8}$ of the height; cycloid, $\frac{7}{16}$ of the height; prism or cylinder, the point of bisection of the line joining the centres of gravity of the two ends; pyramid or cone, $\frac{3}{4}$ from the base of the line drawn from the vertex to the centre of gravity of the

1. use. When such a body is suspended from the centre of gravity it acts as if the entire weight were concentrated at that centre; therefore, if the centre of gravity be supported, the whole body will be supported.

3. *Centre of Gyration*.—This term, which is almost peculiar to English mathematicians, and is now almost disused, has the following meaning:—It is the point at which, if the whole of the matter in a body were collected, given forces would produce the same angular velocity of rotation in a given time as they would do if the particles of the body were distributed in their proper places.

4. *Centre of Oscillation*.—The point in which the whole of the matter must be collected, in order that the time of oscillation may be the same as when it is distributed.

5. *Centre of Percussion*. That point of a revolving body which would strike an obstacle with the same force as if the whole of the matter were collected in it.

6. *Centre of Pressure*.—The point at which the whole amount of pressure may be applied with the same effect as it has when distributed.

CENTRIFUGAL and **CENTRIPETAL FORCES**, forces which urge a body to avoid (*fugere*) or to seek (*petere*) a centre; in more modern language, attractive and repulsive forces.

We intend here to confine ourselves to the term *centrifugal force* in one particular sense in which it is used in mechanics and astronomy, because it involves a point which is frequently mistaken. The term force, as used in mechanics, implies simply any cause of motion which is external to the matter moved; and since the state of matter left to itself is either that of rest or of uniform motion in a straight line, every other species of motion, of what sort soever, is an effect of force from without, which assertion is verified in every instance in which it can be tried.

Suppose we fasten a string to an immovable obstacle, such as a post, and pull it, say, with a force of a hundred-weight. It may not at first sight appear proper to say that the post also pulls the string, because we may not be able to conceive the latter acting, but only resisting. Nevertheless, the part which the post sustains—call it action or resistance—is still the equivalent of a force, for if it were removed, and another hand applied to the other end of the string, that hand must also pull against the first with a force of a hundred-weight before the counteraction of the moving tendency of the first pressure is supplied.

Next, it must be remembered that no alteration whatever of the effect of inertia can be produced without force of some kind. Let us now suppose a small bullet attached to a string, which string is fastened to a point upon a table, friction and the resistance of the air not being supposed to exist. Let the bullet be placed in a state of revolution round the fixed point, by means of the string, and with a given velocity. It will continue to move round with the same velocity, and the string will be stretched by a pressure depending upon the mass of the bullet and its velocity. The reason of the permanence of the velocity is contained in a proposition which is demonstrated in mechanics—viz., that forces applied perpendicularly cannot change velocity, but only direction. Now, in the present case the bullet must describe a circle, and the direction of the string, in which the retaining pressure acts, is always perpendicular to the tangent of the circle, being always a radius. This pressure of the string must be caused by an effort to escape on the part of the bullet, arising from its tendency to continue its motion in the direction of the tangent. This is the centrifugal force, and does not arise from any tendency which the body has to fly from the centre, but from this circumstance, that there is in the motion above described a constrained approach to the centre, or rather a constrained continuance at the same distance from the centre, such as would not exist in the motion of the bullet uninfluenced from without.

This centrifugal force is thus measured:—Suppose, for instance, the velocity of revolution in the circle to be 8 feet per second, and the radius 10 feet; divide the square of the velocity by the radius, or divide 64 by 10, which gives 6.4. Then the pressure is such that were it to take the place of the earth's attraction, the bullet, being allowed to fall, would at the end of one second have acquired a velocity of 6.4 feet per second, instead of 32, which is the case with bodies falling freely to the earth. And if we ask what weight must be hung to the string so that it may receive the same pressure as when constraining a bullet of 2 lbs. in weight to move at 8 feet per second in a circle of 10 feet radius, the answer is, such a proportion of the weight of the bullet as 6.4 is of 32.

$$\text{or } \frac{6.4}{32} \times 2 \text{ lbs., or } \frac{384}{965} \text{ of a lb.}$$

If, then, this latter weight, hung at its end, would be the utmost the string would bear without breaking, then any accession of velocity in the preceding motion would also break the string.

CENTRIFUGAL and **CENTRIPETAL** are terms used in botany generally with respect to the INFLORESCENCE. Centrifugal inflorescences are those in which the flowers open, beginning from the centre towards the circumference, or from the apex towards the base. In the latter the flowers open from the base to the apex, or from the circumference to the centre.

CENTURION. A centurion in the Roman army was the commander of a centuria, a term which we cannot conceive to have originally signified anything except a hundred. A centuria, as a division of an army, signified a number of men under the command of a centurio. When the Roman legion contained thirty manipuli and sixty centuries, the number of centurions would be sixty; but as the number of the legion was not a fixed number, we must suppose that the officer called a centurion had at various times a varying number of men under him.

The pay of the soldier in the infantry is stated by Polybius at two oboli a day, and double to the centurions. The obolus is a sixth part of the Attic drachma, or one-sixth part of 9½d. This would, therefore, make the monthly pay of a centurion about 16s.

The duties of the centurions were to command their several manipuli. They received their orders from the tribunes of the legion, who received theirs from the commander of the army, whom they visited every morning to receive their orders, which they then gave to the centurions. They also superintended the soldiers when they were engaged in the military works, such as castrametation. They had also to go round to inspect the watches; at least this is stated as among the duties in some passages of the Latin writers. The badge of office was a stick made of the stock of a vine (*vitis*).

CEORL or **CHURL**, one of the social ranks among the old English, or, as the fashion used to be to name them, the Anglo Saxons. **ARHINGS** (royal blood), **EORLS** (nobles), **THEGNS** (knights), and **CEORLS** (yeomen) divided the free, and the slaves or **THRALES** completed the folk. The eorl's oath outweighed that of six ceorls, and his **WILGILD** was great in proportion, being 1200 shillings; the ceorl's was 200 shillings. The ceorls were not noble, and could never become earls, like the thegn; they were freemen, capable of holding property, and indeed if they held 5 hides of land, together with a church and a house, they were, by the laws of Edward the Elder (A.D. 920), *thegn-worthy*, and might, by the king's grace, be made thegns. But those who were not so fortunate as this sank into dependence on the nearest thegn or courtier-knight, as society became less individual, and indeed were not far removed from serfdom; so that, for the protection of the

state from lawless men desperate with poverty, Athelstan (925-940) declared that "every landless man must have a lord," who would at once afford him protection and be answerable for his misdeeds.

CEPHALANTHUS OCCIDENTALIS, or Button-wood, is a North American plant, belonging to the order RUBRACEÆ. It is common in swamps, ponds, and stagnant waters, from Carolina to Canada, forming a shrub from 6 to 15 feet in height, with a light spongy wood. The inner bark of its root is an agreeable bitter, and is frequently used as a remedy for coughs. The flowers are yellowish-white, in globular heads, about the size of a marble, hence the common name, as well as the generic title (from Gr. *kephalē*, head; *anthos*, flower). The parts of the flowers are in fours, the style is long with a capitate stigma. The genus is briefly distinguished from its nearest allies by the two-ovelled ovary, having one ovule in each cell, pendulous from the apex.

CEPHALAS PIS. See PLACODERMÆ.

CEPHALONIA or **CEFALONIA** the ancient *Cephalenia*, an island near the west coast of Greece, and the largest of the seven Ionian Islands. The greatest length, in the N.W. and S.E. direction is 31 miles; and the breadth near the middle is about 10 miles, but in the north part it is almost 20 miles. Cape Scala is 23 miles W.N.W. of Cape Chiarenza, the northern point of the Morea. The area of Cephalonia is 318 square miles, and the population in 1883 was 80,000. The surface is in great part mountainous and barren, the soil being scantily spread over the limestone rock; but the inhabitants are very industrious, and have planted vineyards wherever there was the least prospect of success. On this island is the highest mountain in the Ionian group, Mount Elato or Monte Negro (the "Black Mountain"), so called from the darkness of the pine-woods, which are so plentiful in Cephalonia. It is the ancient Mount *Enos*, and attains a height of 5300 feet. The range of which this is the highest summit runs in the interior from N.W. to S.E. The shores are indented by numerous bays, of which that of Argostoli is the principal. The climate is mild, but subject to storms and violent rains; earthquakes also occur. The island is deficient in fresh water, and partly owing to the sparseness of the inhabitants little of the soil is under cultivation. The plough used is of the most primitive construction, drawn by two oxen, and making a furrow about 4 inches in depth. Sheep, goats, and a few mountain ponies are the only animals reared; but no pains whatever are taken to improve the breeds. Many of the peasants proceed to the Continent in quest of work during the summer, and return to their homes in the autumn in time for their own vintage.

The principal article of export is currants, and next to wine and oil. The value of the exports to all countries is about £170,000, and of the imports £180,000 per annum. The imports from the United Kingdom are valued at £40,000, and the exports thereto at £80,000. Large quantities of grain are imported; the other articles being sugar, cotton, salt and dried provisions, sulphur, &c. The chief towns are Argostoli.

The Cephalonians are of the purest Greek descent of any of the inhabitants of the Ionian Isles, and they are remarkable for their activity and intelligence.

By Homer the island is mentioned under the name of *Same*, and by Thucydides as *Tetrapolis*, from its four towns, Samos, Kræon, Palli, and Preinos. It became subject to Rome in B.C. 187. After the division of the empire it was subject to the Byzantine emperors till the twelfth century. It came into the possession of the Venetians in 1224. It was invaded by the Turks in 1479, and retaken by the Venetians twenty years after, who retained it till the fall of the republic in 1797, when the French took possession of it; but being driven away by the Russians in

1799, Cephalonia was made part of the new state of the Seven Islands under the protection of Russia. In 1815 it was, with the rest of the Ionian Islands, placed under the protectorate of Great Britain, and so remained till 1864, when they were annexed to the kingdom of Greece. See IONIAN ISLANDS.

CEPHALOPODA (Gr. *kephalē*, head; and *pous*, *podos*, foot) is the most highly organized class of the MOLLUSCA. The members of this class are symmetrical animals, having their right and left sides equally developed. They have a large distinct head, a mouth armed with powerful horny jaws, acting vertically like the mandibles of birds; a large and fleshy tongue, and large well-developed eyes. The body, which is soft and fleshy, is enveloped in the mantle, which forms a muscular sac, open only in front. The head protrudes from this opening, is distinct from the body, and has placed round the mouth a number of flexible, fleshy appendages, called arms or feet, which serve both as organs of prehension and locomotion. These arms or feet are usually provided with cups or suckers, called *acetahula*, that act like cupping glasses, and are for the most part unarmed, though in some instances they are furnished with a long sharp claw. They form a single or double series on the inner surface of the arms, and are various in number. In those which are unarmed, the mechanism for producing adhesion is extremely interesting. From the margin of each cup a series of muscular fibres converge toward the centre, at a short distance from which they leave a circular aperture, which is occupied by a cone of soft substance rising from the bottom like the piston of a syringe, and capable of retraction. So perfect is this mechanism, says Dr. Roget, that while the muscular fibres continue contracted, it is easier to tear away the substance of the limb than to release it from its attachment—it being apparently under the complete control of the animal. When the sucker is applied to a surface for the purpose of adhesion, this piston, having previously been raised so as to fill the cavity, is retracted, and a vacuum produced; but when the animal is disposed to let go its hold, the piston is at once pushed forward, and the vacuum produced by its retraction is in an instant destroyed. The respiratory organs are branchial, and contained in a pouch which communicates with the surrounding medium by a sort of funnel, projecting beyond the edge of the mantle, and pointing to the head. The chief nervous mass is situated in the head, and is enclosed in a gristly or cartilaginous box, called the "cephalic cartilage," which forms a kind of protective case or "cranium," and also serves for the attachment of many important muscles. The tongue is beset with horny points; the œsophagus widens into a kind of crop, leading to a gizzard, to which succeeds a third stomach, membranous and somewhat spiral, into which the liver pours the bile. The intestinal canal terminates in the funnel. Generally there are two hearts for the propulsion of the blood through the respiratory organs, and one for the circulation of the arterial blood through the body. The sexes are distinct. Many species are provided with an ink bag, from which a duct leads into the funnel or siphon, and through this the ink is ejected at the will of the animal; staining the water around, it conceals the animal as in a cloud from observation. The skin of the naked species is changeable in its colours; this power is due to the presence of small pigment cells (*chromatophores*) capable of dilation. These animals are most extensively distributed, and are wary, active, and voracious, preying upon fishes and crustacea. They dart through the water with singular velocity.

The class Cephalopoda has been divided into two orders—those which have the body naked, and have no shell, or only an internal one; and those in which the body is enclosed within an external-chambered shell. The first group, the Naked Cephalopods, have all of them only two

branchia or gills; whilst the second group, the Shell-bearing Cephalopoda, possess four. This essential character has been considered as the best for dividing them, as one of the families of the first group (Argonautidae) is now generally allowed to possess a shell, though not a chambered one; and another (Spirulidae) has a chambered shell, which though certainly an internal one, nevertheless in one of the species appears to contain a portion at least of the animal within its last chamber.

Following Professor Owen's nomenclature, the Cephalopoda are usually divided into two orders, the Dibranchiata, or true CUTTLE-FISH, and the Tetrabranchiata, of which the NAUTILUS is the sole living representative. See also AMMONITES, ARGONAUT, BELEMNITES, OCTOPUS, SQUID.

CEPHALOTUS is a genus of Pitcher Plants. They have no connection with the Pitcher Plants belonging to the genus *Nepenthes*, but belong to the order SAXIFRAGEÆ. There is only one species, *Cephalotus follicularis*, which is found only in one place, in swamps by King George's Sound, Australia. It is an herb, with the habit of a saxifrage; leaves all radical, some flat, others changed into pitchers with lids; flowers on a scape, small and white. The calyx is valvate, and has six divisions; there are no petals; there are six stamens, inserted under the margin of the villous disc; six verticillate carpels ripening into achenes; ovules erect, one or two in each carpel; embryo very short, in the axis of fleshy albumen.

CEPHALUS, the son of the hero Dionæd, was husband of Procris, daughter of Erechtheus. The myth of their tender conjugal affection has been the theme of poets and painters of all time. Even the rustics in Shakspeare's "Midsummer Night's Dream" introduce the legend in their "play" (Act v.)—

"*Thy* Not Shafalus to Procris was so true,
Phæbe. As Shafalus to Procris I to you."

Eos, the goddess of the dawn, loved Cephalus vainly. She maliciously advised him to test the fidelity of his wife. Aided by the goddess, he tempted Procris in disguise, plying her with rich gifts, and discovering himself when she wavered as to receiving them. Procris, overcome with shame, fled to Crete. Artemis, the virgin goddess, gave her a dog and spear, sure of scent and aim, and sent her back disguised to her own land. Here Cephalus found her and won her for the sake of her magic possessions, whereupon Procris in her turn discovered herself, and the reconciliation was eager and joyful. In the end Cephalus by accident mistook his wife for a wild beast among the thick forest underwood, and aimed the magic spear at her. This time also it struck its mark, and left him widowed and full of mourning all his days.

CEPHEUS, father of Andromeda, placed after death among the stars next his wife, **CASSIOPEIA**, as a constellation. This is one of the ancient star groups of Ptolemy, and comes on the meridian at midnight in August. It will be found close to the pole (feet inwards) in our Plate **CONSTELLATIONS**, Northern Hemisphere.

CERAM or **SIRANG**, a long narrow island of the East Indian Archipelago, situated to the west of New Guinea. It is about 200 miles long, and about 50 miles at its greatest width. Its area is about 6000 square miles. A chain of mountains, reaching the altitude of 7000 feet—in one case, that of Nusa Keli, attaining 9500 feet—traverses it in the direction of its length, in the valleys among whose offset-ridges there is much fertile soil. The vegetation is luxuriant, and many trees reach a very great height. The sago-palm is more abundant than in the other islands, which are its native habitats; it grows in immense forests, to the height of 100 feet, and a single tree sometimes yields 1200 lbs. of starch. Ceram has many fine forest trees, of which some afford excellent timber for cabinet-work, and it produces rice, the sugar-cane, maize, &c. The coast-

line is indented by several bays, of which the chief are Hatuvi and Savaai on the N., and Huvamohel, Amahay, Nusa Laut, and Selan on the S. The maritime tribes are Malays or Papuans, who are famous for their skill in making arms. The mountain tracts are inhabited by Alfories, of the same stock as the aborigines of Celebes and the Philippines.

For purposes of government Ceram is divided into two parts, Great Ceram and Little Ceram, or Huvamohel, which are connected by the isthmus of Taruno. The island belongs to the Dutch, who had a fort on it as early as 1646. Population, 25,000.

CERAMBYCIDÆ is a family of BEETLES, of the group LONGICORNIA and section TETRAMERA. The Cerambycidae are found in all parts of the globe, but abound most in hot climates. They constitute a most extensive group of beetles, remarkable for the very great length of the antennæ. One of their most important functions appears to be to assist with other wood-feeding insects in the removal of old and decaying trees; it is in the larval state principally that this business is performed. The perfect insects frequent flowers, especially of the umbelliferous kind; the large species are often found on the trunks of trees. The genera ranked in this family are considered by some naturalists to form only a subfamily, Cerambycinae, the family Cerambycidae being regarded as containing all the Longicorns.

CERAMIA'CEÆ is an order of rose-red or purple sea-weeds, belonging to the sub-class Rhodospiræ. The fronds are composed of single strings of cells, with sometimes a layer of small cells, jointed and branching. There are numerous spores in berry-like receptacles, with transparent walls; the tetra-pores are external or partially immersed. Ceranium and Callithamnion are common British genera. An exotic genus, Halophlegma, resembles a crimson sponge; in the species of another genus, Thuretia, the branches are so arranged as to resemble the nerves of a skeleton leaf.

CERAMIC ART is the name now given to the plastic art of the potter in its most general and widest signification. The word comes from the Greek *keramos*, potter's earth. Of the two great divisions of ceramic objects, *pottery* is one of the most ancient of words, the old English *pot* and the Celtic *pot* for the drinking vessel, the Latin *potare* and the Sanskrit *pa* for the act of drinking, all coming from the Aryan root \sqrt{pA} ; while *porcelain* is derived from the translucent shell of the *porcellana*, or Venus-fish. It is almost a pity to add that the Venus-fish gets its Portuguese name from its univalve shell being so like a pig's back in outline that it was called *porcella*, the little pig. As this etymology indicates, porcelain is, as far as Europe is concerned, by very much the more modern manufacture, while pottery, in all countries alike, is the most ancient of arts. Clay is to be found almost everywhere, and moulding it into useful or ornamental forms is suggested at once by its plastic nature. Even in its sun-dried state it is of great use, but how wonderful was the stride towards civilization taken by him to whom accident first showed the effect of baking the rude clay vessels he had made! Baked clay is of all human productions the most permanent. The bricks (even the sun-dried ones) of Babylonia are of almost fabulous antiquity, and the ease with which an inscription or a design could be moulded or impressed upon these bricks and tiles soon led to the beginnings of ceramic art. Some examples of both kinds will be found under the article **BABYLONIA**. The subsequent invention of the potter's wheel, still lost in the remotest antiquity, permitted all the exquisite circular or oval forms to spring to life in the dish, the vase, and the cup. The artist now found in pottery endless opportunity for his most fertile imagination, in form, in decoration, and in simple but

beautiful colour. The ancient Egyptian examples cover almost every conceivable purpose to which vessels can be put, and many of them are very beautiful; but the people who brought the fictile art to the highest point of beauty were the ancient Greeks. In Plate I. are shown some exquisite specimens, from the collections of the South Kensington Museum, of the ceramic art of Greece and of the ancient kindred nations of Cyprus and Etruria. [Fig. 1. Tazza Cylix, painted earthenware. Black, with rings of red at foot. Ancient Greek, fourth century B.C. Height, 5½ inches; diameter, 11¼ inches. Fig. 2. Greek vase, 200 B.C. Fig. 3. Terra-cotta bottle; a long oval, with narrow neck and one handle, painted with black hatching; on the body and neck are eight small eyelets. Ancient Cyprian. Length, 7 inches. Fig. 4. Stand with three cruet or lamp

bowls, each with two handles, and upon a stand with three feet. Ancient Etruscan. Fig. 5. Terra-cotta bowl with two handles, painted outside with leaves and bands in red and black, and inside with wheel ornament and circles in black. Ancient Cyprian. Fig. 6. Terra-cotta dish, painted with concentric band of white and brown. Ancient Cyprian. Height, 2½ inches, diameter, 9½ inches. Fig. 7. Terra-cotta bowl, painted with red bands. Ancient Cyprian. Height, 2½ inches; diameter, 4 inches. Fig. 8. Terra-cotta lamp. Ancient Greek. Fig. 9. Vase. Ancient Cyprian, with two handles. Narrow body and neck, painted with black bands. Height, 9 inches; diameter, 3¼ inches.]

The elegant AMPHORA (woodcut, fig. 1), of which we add a less usual form than is given in the article of that

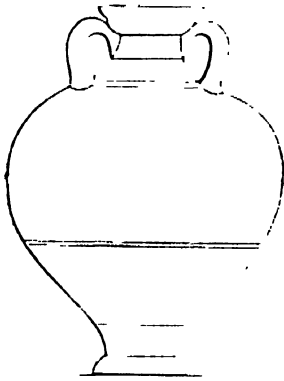


Fig. 1.—Vase-shaped Amphora 'Greek'.

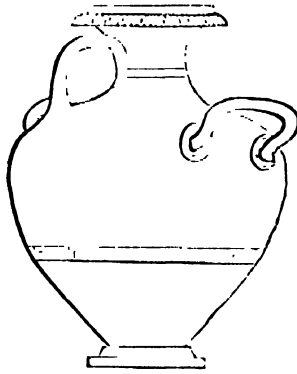


Fig. 2.—The Calpis.



Fig. 3.—The Rhyton, or Drinking-horn.

name: the fine three-handled water-vase or *calpis* (fig. 2), whose third handle assisted so much to lift it upon the head, where it was carried, Oriental fashion; the *rhyton* (fig. 3), at once a thing of the most perfect beauty and an excellent jest, since it must be emptied at a draught or the liquor spilled (for it could not be set down save on its side); the slender-necked *aryballos* (fig. 4), like a purse with its

buried with the dead to do them honour. Sir William Hamilton records one at Polignano which contained sixty of great beauty. Many of our finest specimens were found in this way.

The Greek and Etruscan vases depend for their ornament, not so much upon relief (except as to their mouldings), as upon painting. The figures in the earlier vases are black, but in the best period of Greek art, from the epoch of Phidias and Polygnotos (460 B.C.) for about a hundred years onward, the figures are red upon a black ground. A curious and also an eminently characteristic example of the vases of the best Greek period is the *hydria* (fig. 6) in the British Museum, upon which is represented the device adopted by Medea to induce the daughters of Pelous to put to death their aged father. The ram, which had been restored to youth by the enchantress, is in the act of leaping from the *olla* or cauldron; he faces Medea. Jason is on the opposite side, and the other figures of the composition are behind these two principal actors in the scene. The design is painted in red on a black ground; the outlines are drawn in black, and the minor workings are faintly traced in red, with accessories in white and crimson. Another fine *hydria* of the same style and period, in which horses and *bigae* (chariots) are introduced with figures, is represented in fig. 7. It was found at Vulci, and is preserved in the Museum of Practical Geology, Jermyn Street, London. In height it measures 22 inches.

Another method was to paint the ground with a rich lustrous black glaze, so that the figures were left in the red terra cotta of the vase itself. A very fine specimen of this style from Campania is here shown (fig. 8), the original being in the Museum of Geology. The details of the figures are sketched in with black, and white is introduced occasionally to lighten the effect.

At the same time relief is used occasionally with great

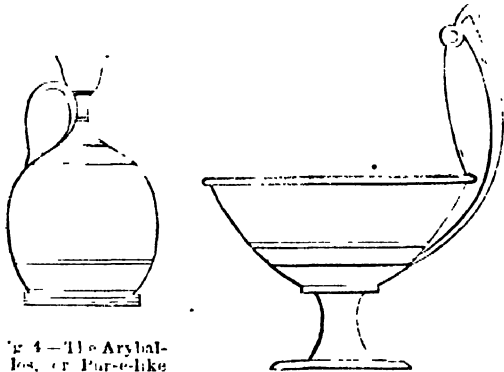


Fig. 4.—The Aryballos, or Purse-like Vase.

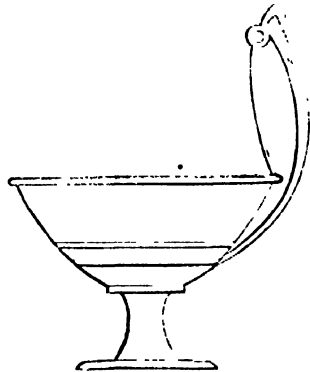


Fig. 5.—The Cyathos, or Dipping-cup.

string lighted (which its name signifies), useful for keeping in good order oil or wine; or the *cyathos* (fig. 5), most beautiful of drinking-cups, with handle thrown boldly up in the air, lest the finger should touch the wine in the cask when dipping it out; these are here given out of the wealth of Greek vase-forms, the admiration and the models of the artists of all succeeding ages.

In Southern Italy, in Campania, and further north, in Umbria (as at Orvieto, &c.), tombs are now and then discovered containing large numbers of beautiful vases,

effect, as in the accompanying very beautiful ribbed example (fig. 9), of about 200 B.C., taken from the same collection. The ornament on the neck is partly in relief and partly incised.



Fig. 6.—Hydria—figures in red upon a black ground.



Fig. 7.—Hydria—figures in red upon a black ground.

By the Romans *terra cotta* was extensively used in architectural details, and for moulding figures, before marble sculpture had come to them from the Greeks.

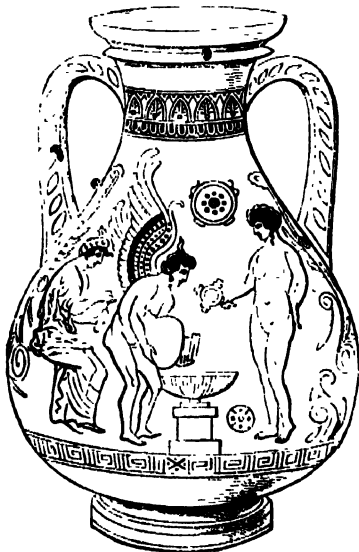


Fig. 8.—Vase—figures left the natural red ground painted a lustrous black.

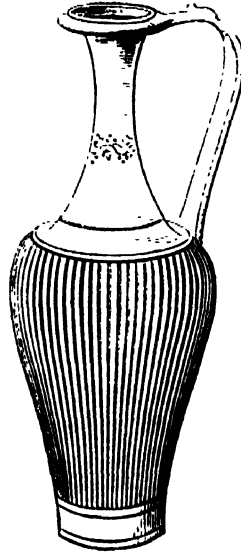


Fig. 9.—Ribbed Vase, Campania, body red, the rest black.

Bee-hives, money-boxes, toys, altars, mouse-cages, theatre tickets, &c., were all products of the ceramic art among the Romans. But their vases cannot compare for beauty or fineness of material with those of the Greeks, except only in one particular. This is the famous Samian ware, produced from the first to the third century of our era, and made at Samos and in Italy and Gaul. This is of a rich, red, sealing wax colour, well worked before moulding. The vessels vary considerably in form, but are rarely of a large size. They are thin and delicate in their structure, and it may be inferred that they were considered valuable in ancient times from the fact of fragments being often discovered neatly riveted with lead. The red hue of the body or paste, as well as that of the brilliant glaze, is derived from the sesquioxide of iron.

Across the centre of the bottoms of most Samian vessels are stamped the names of the potters, and they also appear upon the exterior surface of the embossed examples. The vessels themselves are either plain with mouldings, or they have delicate and fine patterns that have been appropriately designated *engine-turned*, or they are embossed with foliage and groups of figures. The scrolls, foliage, and other arabesques which appear on the Samian vessels very commonly have a decidedly architectural character, and they rarely fail to demonstrate the sound taste of the artists employed in their production. A common form of Samian bowl, with characteristic arabesques moulded in relief, is shown in fig. 10. The fragment in the British Museum, represented in fig. 11, is in the highest degree characteristic of Samian ornamentation;

the figures are gladiators engaged in combat. Some few examples have the figures modelled in high relief, and affixed to the ware during the process of its production, instead of being moulded upon it. Moulds or materials

used in producing the embossed Samian have been occasionally discovered; they contain the designs impressed upon them in intaglio—as in the fragment (fig. 12) found near Mayence—by means of a master-mould in relief.

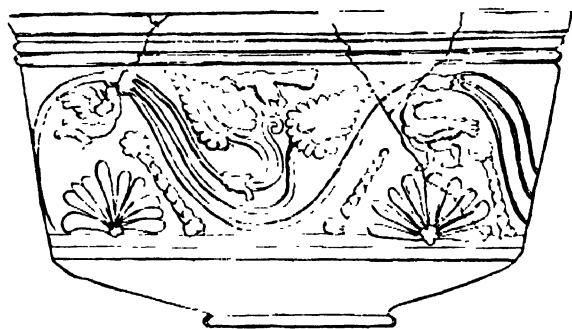


Fig. 10.—Samian Bowl, with figures moulded in relief.

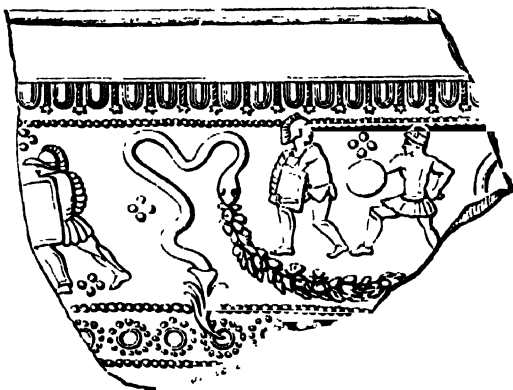


Fig. 11.—Samian fragment, figures affixed during manufacture.

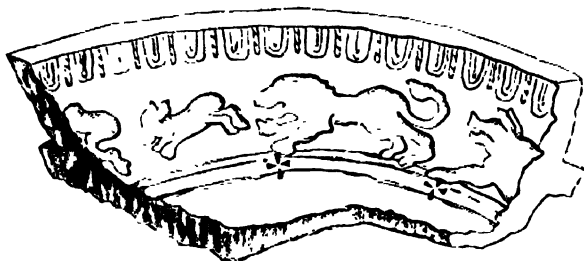


Fig. 12.—Fragment found near Mayence.



Fig. 13.—Vase of black so-called "Castor" ware, Roman.

The Romans also had a finely artistic black ware, the *claud* being given merely by the glaze. The vase engraved here (fig. 13), found at Water Newton, in Northamptonshire, is a most characteristic example.

Hitherto we have touched upon dull pottery, except so far as the simple glazed vases of the Greeks and the fine Samian ware of the Romans are concerned; but passing to the work of Orientals we come upon a fresh division, that of the beautiful glazed pottery. The exquisite *azulejos* or wall-tiles of enamelled pottery, covering floor, walls, and roof of the Alhambra in its palmy days, and of which so few now remain, are products of the ancient art brought from Persia and Arabia by the Moors, while their travels along the northern shores of Africa may be traced by the pottery left behind them. We must refer to the article MAJOLICA for an account of the manner in which this art, by Christian conquests and by friendly intermixture with the Moors, was acquired for Italy; so that about the time of Raphael one of the most magnificent ceramic productions was developed in all its splendour. Majolica bears so many of Raphael's designs that for a long time it was called Raphael ware in England. Its now universal name is simply the Italian *for* Majolica, the Moorish pirate colony, whence the first enamelled plates were brought by the Pisans, and built into the walls of their churches as medallions, some of them remaining to this day. As the derivation is of some importance as showing the Moorish origin of majolica, the line of Dante in the 28th Inferno may be quoted:—

"Tra l'isola di Cipri e di Maiolica"
 ("Between the islands of Cyprus and Majorca")

The enamel of early majolica and of Moorish pottery depends for its beautiful iridescent lustre on oxides of lead laid

over a thin coating of fine white Siena clay, with which the coarse earthenware basis was covered. But the fine majolica, of a piece of which we give a coloured sketch in fig. 1, Plate III., was much later in date, and bore a tin enamel. This was first brought to perfection by Luca Della Robbia, whose works rival the finest sculpture in beauty, and are one of the glories of Florence, being, from the permanence of the enamel, as fresh as the day they came from the oven. At the same time other artists were fashioning vases, dishes, plates, &c., out of this superb ware, and these were frequently decorated with pictures in enamel of considerable execution.

But the introduction of Oriental porcelain into Italy checked at once and for ever the rich art of majolica. Porcelain is so far superior to pottery in its material, as considered from the artistic side, that it is no wonder that the pains and costly work spent on the humble clay to convert it into a work of art was diverted to the finer manufacture. But before passing to porcelain, it will be necessary very briefly to notice here some forms of pottery which have been remarkable on the side of art, the side of the subject to which the present article is limited. These are as follows:—The very rare *Fayence* of Henry II. of France, of which only thirty-seven pieces remain, exhibits such fine design and material that it is bitterly to be regretted the art is entirely lost. It is a fine white pipe-clay, very hard, unlike majolica, the basis of which is soft. It has no coating, but is glazed upon the body itself. Patterns are incised or impressed and filled with enamel, and also ornaments in renaissance style are raised in bold relief. The effect is wonderfully rich. Then we have the somewhat earlier ware of *Palissy*, more resembling majolica, much beloved of Catharine de Medici, mother of Henry II.—bright in colour, but not so pure in tint as the Italian.

Palissy ware, with its lizards, shells, and leaves in high relief all over the surface, is too well known to need much description. Delft was a remarkable earthenware, very plentifully produced from the fifteenth to the seventeenth century in imitation of Japanese porcelain, its glaze, form, and colour being close reproductions of the original. It remained, however, clearly pottery, and was superseded by Wedgwood ware. We give an illustration in Plate III., fig. 6, of another famous sort of pottery, the very hard stoneware (Grès de Flandre) brought to perfection by JACQUELINE DE HAINAULT, that wife of our "good Duke Humphrey," duke of Gloucester, whose romantic history, in the early fifteenth century, fills a large space in memory. The later wares have a brown or reddish colour in place of the earlier yellow, and have ornaments in relief; the beautiful blue, gray, and purple of the finest period, 1540 to 1620, is very noteworthy. This stoneware is of clay mixed with sand and glazed with salt. Lastly, England has had the glory of producing the finest pottery ever seen, the Wedgwood ware. A specimen of Wedgwood's marvellously beautiful "Jasper ware," with its subjects in cameo relief, is shown in Plate III., fig. 3. See also POTTERY, MAJOLICA, PALISSY, WEDGWOOD.

PORCELAIN is dealt with in detail in the article of that name. For our purpose here it is sufficient to say that it differs from pottery in being composed of two substances, one an aluminous clay or kaolin, the other a felspar or silicious rock, the petunse of the Chinese, the first of which keeps its form under heat intense enough to melt the second and convert it into a sort of glass. Porcelain is thus midway between pottery and glass; and, indeed, Réaumur made a sort of porcelain by adding earthy substances to glass, while Böttcher, early in the eighteenth century, succeeded in making the fine Dresden porcelain by adding vitreous substances to earthenware. Porcelain is divided into hard and soft, and the latter into that which is artificially softened by mixture of earths, or that naturally soft. Hard porcelain cannot be scratched by a file, is extremely brittle, but resists intense heat; soft porcelain is less liable to fracture, allows the painting to sink into it (producing an exquisite softness of tint), and although capable of resisting great heat is far inferior in this respect to the hard porcelain. The China ware is so universally known that its mention is sufficient; some characteristic specimens of it are represented in Plate II., figs. 1 and 2. The delicious blue of the Nankin ware, simple though it is, has never been equalled. China is a hard porcelain, but as the clays are more fusible than ours it is made with less fierce heat than that required for Sévres, &c. Japanese porcelain, of which also several pieces are given in the same Plate, figs. 3, 4, and 5, is simply a variety of Chinese, but as is usual in the arts of the two nations Japan has far excelled her teacher. Japanese porcelain is of finer paste, finer form, and incomparably finer colour than Chinese. Porcelain, if elaborately coloured, is always a precious article; because, as the various colours require each its own degree of heat to fix it, the pieces have to undergo so many repeated firings that many are spoiled for every one that is finally successful.

Dresden porcelain, entirely of European materials, was the first European hard-paste porcelain, and was invented by Böttcher after repeated trials. Its manufacture was long kept a jealous secret. The modelling and painting of Dresden are of consummate excellence, the period from 1731 to 1756 being its palmy time. The Seven Years' War then dealt it a heavy blow, from which it has never recovered. When the establishment was reorganized many rivals had sprung up, and it became unable to pay its expenses except by producing cheaper articles. It is unfortunate that consummate excellence in ceramic art is only to be obtained, so far as past experience goes, under the protection of secrecy, monopoly, and royal favour.

Chelsea porcelain, of which a specimen is given in Plate III., fig. 5, was a soft-paste porcelain about coeval with Dresden. The manufacture only lasted in its prime about half a century. The clay is believed to have been imported in part from China. The form and colour are highly esteemed. A little before 1765, the time when Chelsea succumbed, Dr. Wall set up the Worcester manufactory, and introduced the ingenious application of printing which has given us such countless beautiful designs at prices within the reach of all. At first he made chiefly imitations of the Chinese blue and white Nankin ware, but subsequently copied the Sévres style, especially the bleu-du-roi, with excellent success. The paste, form, and manipulation of the painting are inferior to Chelsea, however, and not to be compared at all with Sévres.

Finally, we come to this most famous of porcelains, unrivalled in its class, as is Wedgwood in the great sister division. Sévres was exclusively soft paste from the foundation, 1695, till about 1770, and hard paste was introduced from that date onwards. Between 1770 and 1801 both pastes were used. Louis XIV. at once granted a monopoly on the discovery of French porcelain, and his successor gave the factory every mark of favour. It was first at Vincennes, removing to Sévres in 1756. The exquisite creamy softness, the beauty of the painting, and depth of glaze in the earlier Sévres place it at the head of all porcelain; the painting of the hard paste is cruder and the colour harder and not so perfect. The bleu-du-roi of old Sévres, and the rose du Barry (really made for Madame de Pompadour), are the most famous of all the colours used in ceramic art; they are a delight to the connoisseur and to the ignorant alike, and hitherto have been unsurpassed. An example from the Jones collection in the South Kensington Museum will be found in Plate III., fig. 2. Sévres is excessively costly. Without much exaggeration it may be said that it would be cheaper to use silver. At present the costlier productions of the ceramic art are somewhat in abeyance, royal and aristocratic taste having turned elsewhere; but one of the great joys of the man who has a taste for art is to see culture now being widely diffused by the vessels of delicious colour and exquisite design produced by the great manufacturing firms of our day. It would be invidious to mention names, but half a dozen occur at once to the mind as honourably distinguished in this beneficent work of educating the masses. It costs no more to make a beautiful form than an ugly one, if they are equal in complexity. The people's eyes are opening to this, and the successors of Wedgwood, employing excellent artists as they do, reap a rich and well-deserved reward. Ceramic art, though admittedly less perfect in individual instances than it has been, was never so healthy and energetic, was never productive of so much enjoyment, as now that it reposes upon the growing appreciation and demand for its productions on the part of the masses of the people.

CERASTES. See VIPER.

CERASUS, a genus of hardy trees, including the common cherry. It is hardly different from *Prunus*, there being little or nothing to distinguish it beyond its leaves when young being folded flat, instead of being rolled up, and accordingly it has been referred back to that genus by Bentham and Hooker in their "*Genera Plantarum*." It will be convenient to consider the species here rather than under the heading *PRUNUS*. The genus may be divided into the True Cherries, the Bird Cherries, and the Laurel Cherries.

1. TRUE CHERRIES.—The flowers grow in umbels or singly, appearing earlier than the leaves.

Cerasus Avium, the Wild Cherry, a native of the woods of Europe and the west of Asia, and in a cultivated form common in gardens. In this country it occurs as far to the north as Ross-shire, where it exists in the form of a

dwarf bush propagating itself rapidly by the roots. The wood is somewhat remarkable for the large size of its medullary processes, which give its longitudinal section a bright satiny lustre, and render it well suitable for ornamental cabinet-work.

Cerasus vulgaris (*Prunus Cerasus*), the Common Cherry, is found wild in the woods of Asia Minor, where it acquires a very large size. One variety is chiefly seen in gardens, the other grows in woods in the interior, particularly on the banks of the Sakari, the ancient *Saugarius*. The trees attain a gigantic size; they are ascended by perpendicular ladders suspended from the lowest branches. It was introduced into Europe by the Romans under Lucullus, about half a century before the birth of Christ, and has ever since formed one of the most esteemed varieties of dessert fruit. It is now so well established in Europe and England that many botanists consider it indigenous.

Cerasus Chama-cerasus, the Ground Cherry, a dwarf species, never rising above 3 or 4 feet high, is common in Austria, Hungary, Germany, Russia, and Siberia.

Cerasus nigra, the Black Canadian Cherry, is rather a handsome tree, with loose umbels of pinkish flowers. The fruit is as large as a moderately sized cherry.

Cerasus depressa, Sand Cherry, is found in Canada and the more northern of the United States, but appears to be unknown in the southern States. In our gardens it is a handsome bush, but short-lived. The nurserymen propagate it by budding on a plum stock.

Cerasus prostrata, the Spreading Cherry, a small prostrate bush, found on the sea-coast of Candia and on the mountains of Dalmatia and Asia Minor, where it enlivens the rocks with its gay pink blossoms late in the spring. In this country it is rare. It will live without protection in winter, but it prefers a moderate degree of shade, and is admirably suited for rockwork in sheltered places.

Cerasus Japonica, the Dwarf Almond, a native of Japan, and long known in our gardens as the double dwarf almond, one of the most beautiful objects that appear in the month of March.

2. BIRD CHERRIES.—Flowers grow in long racemes, appearing after or at the same time with the leaves.

Cerasus Mahaleb, the Perfumed Cherry, a shrub or small tree, remarkable for the powerful and agreeable odour of its flowers, and the bitter, nauseous taste of its fruit. A native of south Europe.

Cerasus Padus, the Common Bird Cherry, a common species, wild in the woods and hedges of the middle parts of Europe.

Cerasus Virginiana, the Choke Cherry, is a large tree, growing in the United States to from 80 to 100 feet high. Its fruit is not very edible in a recent state, but when dried and bruised it forms an esteemed addition to penmanic.

Cerasus capollin (*Prunus capuli*), Mexican Bird Cherry, a native of the mountains of Mexico. In this country it is rather tender, but forms a handsome object when trained to walls or palings. Its bark is reputed a valuable febrifuge.

3. LAUREL CHERRIES.—The flowers grow in long racemes, appearing with the leaves, which are evergreen.

Cerasus Caroliniana, the Carolina Laurel Cherry, a very uncommon species in the collections of this country, to the climate of which it is not adapted. It is one of the most ornamental of the trees of Carolina, where it grows on islands and along the banks of rivers, from 30 to 50 feet high, with a regular oval head.

Cerasus Lauro-cerasus, the Common or Broad-leaved Laurel (Cherry). This valuable and common evergreen, which now gives half their richness to the varied pleasure-grounds of Great Britain, which is so hardy that no frost seems to affect it, which is equally capable of resisting the greatest heat and drought of summer, and which will

flourish either in the most exposed or the most shaded situations, is a native of the country near Trebizond, in Asia Minor, and was sent from Constantinople to Kelsue in the year 1576 by the imperial ambassador Ungnad.

Cerasus lusitanica, the Portugal Laurel (Cherry), a native of Portugal, and also found in the Canaries, where it acquires a height of 60 or 70 feet.

CE/RATES (Lat. *cera*, wax), the name given to certain combinations of wax with other substances, which are used as external applications in the treatment of various surgical cases. They are of a degree of consistence intermediate between that of plasters and that of ointments, and according to the nature of the materials united with the wax are capable of serving different ends. They may be emollient when applied to inflamed or chapped surfaces, or stimulating when applied to indolent ulcers.

CERATO'DUS is a fish belonging to the order **DREXOI**. This curious fish is an inhabitant of the rivers of Queensland. The native name for it is Barramunda. It was discovered for the first time in a living state in 1870. This discovery proved one of the greatest importance and interest, as competent ichthyologists pronounced that this fish was identical with one of Triassic age, upon whose fossil teeth the genus *Ceratodus* had been formed. The living fish was therefore named *Ceratodus forsteri*. The teeth, which are similar in the living and fossil animals, are very large and long, in some cases attaining a length of 2 inches. They have a flattish, undulated, and punctated crown, with one margin convex and with from 3 to 7 sharp prongs projecting from the opposite margin. These teeth are four in number—two in each jaw. Besides these, which are used for grinding, the vomer is armed with two incisor-like teeth, whose function is to tear up the leaves upon which the barramunda feeds. The barramunda is found both in fresh waters and the brackish waters at the mouths of rivers. At night it is said to leave the stream and go on the mud flats, which are left uncovered by the tide. The stomach is generally crammed with an enormous quantity of dead leaves. The flesh is esteemed as food. It is a large fish, weighing as much as 20 lbs., and reaching a maximum length of 6 feet. The body is elongated, compressed, covered with large-cycloid scales, and provided with one continuous vertical fin. The head is flattened and broad, with a broad snout; the eyes lateral and rather small. There are no external nostrils. The limbs differ considerably from the fins of ordinary fishes; they are paddle-shaped, and are four in number, the first pair being placed just beneath the head, and the second near the tail, both on the ventral side of the body. Their central portion is covered with scaly skin, and the entire fin is surrounded by a broad, rayed fringe. Each fin consists of a central, jointed axis, the joints gradually becoming smaller and thinner towards the extremity. On either side of the axis are numerous branches, with one, two, or three joints. The skeleton of *ceratodus* is cartilaginous, but some portions of the skull are ossified. The central gelatinous rod (*notochord*) found in the embryos of vertebrates is persistent, and is nowhere divided into separate vertebrae. Besides well-developed gills, this fish is provided with a lung. This at first sight seems to confirm the assertion that the barramunda spends much of its time on land. Dr. Gunther, however, doubts this assertion. "It is much more probable," he says, "that it rises now and then to the surface of the water in order to fill its lung with air, and then descends again until the air is so much deoxygenized as to render a renewal of it necessary. It is also said to make a grunting noise, which may be heard at night for some distance. This noise is probably produced by the passage of the air through the oesophagus when it is expelled for the purpose of renewal. As the barramunda has perfectly developed gills, beside the lung, we can hardly doubt that, when it is

in water of normal composition, and sufficiently pure to yield the necessary supply of oxygen, these organs are sufficient for the purpose of breathing, and that the respiratory function rests with them alone. But when the fish is compelled to sojourn in thick, muddy water charged with gases, which are the products of decomposing organic matter (and this must be the case very frequently during the droughts which annually exhaust the creeks of tropical Australia), it commences to breathe air with its lung in the way indicated above. If the medium in which it happens to be is perfectly unfit for breathing, the gills cease to have any function; if only in a less degree, the gills may still continue to assist in respiration. The barramunda, in fact, can breathe by either gills or lungs alone, or by both simultaneously. It is not probable that it lives freely out of the water, its limbs being much too flexible for supporting the heavy and unwieldy body, and too feeble generally to be of much use in locomotion on land. However, it is quite possible that it is occasionally compelled to leave the water, although we cannot believe that it can exist without it in a lively condition for any length of time.

CERBERA, a genus of plants belonging to the *APOCYNACEÆ*, and containing, among other poisonous species, the *Cerbera Tanghin*, from which the tanghin poison of Madagascar is procured. The kernel of the fruit must be a very powerful poison, for it is not much larger than an almond, and yet one is sufficient to destroy the lives of many persons. Ralamia, king of Madagascar, abolished the use of it as an ordeal, which had been practised for many ages as a supposed means of detecting crime, but it was revived in the following reign. A portion of the kernel was given to the suspected person by the Skidor priest. If he recovered, he was declared innocent; but if the poison took effect he was considered guilty, and speedily buried. Those that recover are supposed to bear a charmed life ever afterwards, and are respected as the peculiar favourites of the gods.

Cerbera Odollam, a tree 20 feet high, is a native of the salt swamps in the East Indies, China, Queensland, and the Pacific Islands. The fruits are large and green, like a mango, the flesh is harmless, but the nut is a narcotic poison. The leaves are from 6 to 12 inches long, and the flowers white and sweet-scented.

The genus is distinguished by the funnel-shaped corolla, with the lobes overlapping to the left; the anthers being free from the stigma; the two carpels of the ovary distinct; ovules four in each carpel, affixed peltately to the very prominent placenta; drupe with one or two seeds.

CERBERUS is the later name of the guardian of Hades, called by Homer "the Dog." Not content with Homer's vague and terrible image, later poets described Cerberus as a monster with three dogs' heads and a serpent's tail, who dwelt on the further shore of Styx, welcoming the shades who entered Hades, but showing his teeth to those who would attempt to leave the infernal regions. The proverb, "A sop to Cerberus," alludes to the ancients' custom of burying the dead with a morsel of cake in their hands and a coin in their mouth, the latter to pay the ferry of CHARON, the former as a sop to Cerberus that they might pass unharmed. Hercules, as a proof of prowess, dragged Cerberus to the upper air, and then let him return. Dante's gigantic conception of the three-headed monster (whom he calls Lucifer) in the lowest hell of ice, grinding Judas Iscariot, Brutus, and Cassius, as the three arch-traitors of the world, beneath his triple jaws, is one of the most magnificent in the unrivalled "Inferno." The Egyptian "Hell-hound" had the trunk of a hippopotamus and the head of a crocodile.

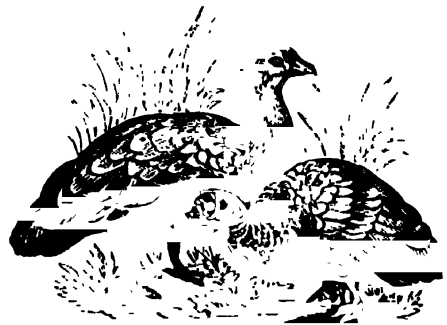
CERDAGNE, a district formerly belonging to Roussillon, but now forming the arrondissement of Prades and part of that of Cérét, in the department of PYRÉNÉES ORIENTALES.

CEREBRAL NERVES, CEREBRO-SPINAL NERVE SYSTEM, &c. See NERVOUS SYSTEM.

CEREBRATION, UNCONSCIOUS, is a term first popularized by the eminent physiologist, Dr. W. B. Carpenter (some time registrar of the University of London), to express a peculiar phenomenon known to all thinkers. The brain's attention being powerfully directed to some train of thought which is interrupted by other avocations or by some interposed difficulty, the thinker finds on resuming the thread of his reasoning some hours, or days, or weeks afterwards, that his train of thought is complete, or his difficulty solved. If he came to a deadlock for want of a name or a reference, it now occurs to him instantly, &c. The phenomenon is somewhat analogous to sleep-walking. We go to bed, and we presently find ourselves in some other part of the house, but of how we got there we are profoundly unconscious. Dr. Carpenter says with great force:—"It is difficult, if not impossible, to account for this fact upon any other supposition than that a certain train of action has been set going in the cerebrum by the voluntary exertion which we at first made; and that this train continues in movement after our attention has been fixed upon some other object of thought, so that it goes on to the evolution of its result, not only without any continued exertion on our part, but also without our consciousness of any continued activity." John Stuart Mill has a striking passage to much the same effect in his "Examination of Sir Wm. Hamilton's Philosophy," p. 285. Although the fact and the explanation are now generally accepted, and the phrase "unconscious cerebration" has become part of the language, yet we must remember that a tired brain is like a tired muscle possibly; rest renews its texture, and it is then able to perform easily the task which it refused before. Undoubtedly some of the many assumed cases of unconscious cerebration are due to this, and others are due to a train of memory being casually excited, and the missing link thus being readily supplied; yet after all deductions are made, the phenomenon remains as frequent as it is remarkable.

CEREBRUM, CEREBRAL HEMISPHERES, CEREBELLUM, &c. See BRAIN.

CEREOPSIS GOOSE (*Cereopsis nova hollandia*) is a curious bird found in Australia, belonging to the same



Cereopsis Goose (Cereopsis nova hollandia).

family of the order ANSERES as the common goose. The cereopsis, in the form of the bill, the length of the leg, and the curtailed extent of the webs between the toes, departs considerably from the ordinary Anseres, and is one of the least natatorial of the order; indeed it seldom takes to the water, and feeds chiefly on grass. M. Bailly states that on Preservation Island it takes up its abode upon grassy declivities, and Captain Flinders found it on Goose Island among the grass and on the shore. Its usual weight is from 7 to 10 lbs.; it has a deep, hoarse, clanging, and though a short yet an inflected voice. Its flesh is excellent.

When in charge of their young the adults are very

pugnacious, and at all times rather spiteful. These birds are fast becoming rare, owing to their unwillingness to fly.

The ceropsis goose is very handsome; the top of the head is pale gray, the rest of the plumage slate gray, each feather on the back and shoulders being margined with a paler tint, while the greater coverts and secondary quill feathers have a round dusky spot near the extremity. The quill and tail feathers are dusky black. The bill is elevated, obtuse, short, and covered, except at the tip, with a cere or membrane, in which are the nostrils. The tip of the bill is black, the cere yellow, the tarsi orange-yellow, and the feet black.

This bird is essentially graminivorous, and is formed for traversing grassy spots, the fertile borders of rivers, or the shore.

CERES is the Latin name for the Greek goddess DEMETER.

CERES, in astronomy, is the name given to the first-discovered of those tiny planets called **ASTEROIDS**, whose general orbit lies between those of Mars and Jupiter. It was discovered by Piazzi, at Palermo, on 1st January, 1801, and was found to be rather less than the moon in size, to have a mean distance from the sun of about two and three-fourth times greater than that of the earth, and to have a year of 1681 days, or a little over four years and seven months more than that of our earth. For the general subject, see **ASTEROIDS**.

CERES, a village of Scotland in the county of Fife, on the Ceres. In the vicinity, on Magnus Moor, Archbishop Sharpe was murdered.

CERIGO, one of the smaller of the Ionian Islands, situated in the Mediterranean, 8 miles from Cape Malea, on the south coast of Greece. It is the ancient *Cythra*, the fabled birthplace and resort of the goddess Venus, and presents a rocky and barren aspect. It was formerly considered the most southern of the Ionian Islands, but was separated from them and included under the monarchy of Argolis and Corinth in 1870. It is traversed nearly through its centre by the meridian 23° E. lon. The chief products are corn, wine, oil, raisins, honey, and wax; some cotton and flax are also grown; a great number of goats are fed. More cattle are reared here than in any of the neighbouring islands. Some remains are shown near the chief town, Capsali, which are stated to have formed part of the temple of Venus, mentioned by Pausanias. The olive-oil and honey produced here are much esteemed.

CERINTHUS is believed to have been a Jew, educated at Alexandria, who lived and taught in Asia Minor in the first century, and was contemporary with the apostle John. He was a heretic, and founded the sect called after him Cerinthians. Authorities differ as to the errors which constituted his heresy, some describing him as a complete Gnostic and others as a sensual millenarian. From the writings of Irenæus we find that Cerinthus held that the world was created by a power separate from God; that he denied the supernatural conception of Jesus, believing him to be merely a man, born like all others, on whom the Holy Ghost descended at his baptism, endowing him with a miraculous power; that the Holy Ghost left him before his crucifixion; and that he died, and did not rise again. Cerinthus is also said to have taught the observance of circumcision, and there can be no doubt that he made use of the Jewish law at least as a symbol for his Gnostic doctrines. The apostle John is supposed by some to have written the fourth Gospel for the purpose of refuting his errors.

CERIUM, a peculiar metal discovered in 1803, by Klaproth and Berzelius, in a mineral previously confounded with wolfram, and now called *cerite*. It is found also with several other rare metals in allanite, orthite, and nitro-cerite. Cerium, as obtained by heating the chloride with potassium, is a gray powder with metallic lustre, which decomposes water and dissolves in dilute acids with evolu-

tion of hydrogen; it is inflammable in gaseous chlorine and the vapour of sulphur. When heated it burns below redness. Its atomic weight is 46; symbol, Ce.

Cerium combines with many other elements. With oxygen it forms two oxides; the first, protoxide or cerous oxide (Ce_2O), is a grayish-blue powder; the ceroso-ceric oxide (Ce_2O_2) is a yellowish-white powder, becoming deep orange-red when heated; both these oxides combine with acids to form salts. With chlorine cerium forms cerium protochloride ($CeCl$), a white, porous, fusible substance, soluble in water. With bromine it forms a bromide, of which little is known. With fluorine it forms a fluoride (CeF), and a sesquifluoride (Ce_2F_3), crystallizing in six-sided prisms. With sulphur it forms cerous sulphide (Ce_2S), resembling mosaic gold. With selenium it forms a reddish-brown selenide, having a disagreeable odour. With phosphorus and carbon it forms black compounds.

Cerium, when ignited with borax before the blowpipe, gives a glass deep red while hot, which becomes colourless on cooling. It is also known by forming a white crystalline precipitate with sulphate of potassium, insoluble in excess of this salt.

The oxides of cerium combine with nitric, carbonic, sulphuric, and phosphoric acids to form salts. The salts of the protoxide are mostly colourless, sweet-tasted, and soluble in water. The salts of the sesquioxide are generally of a yellowish-red colour.

Ores of Cerium.—The principal ores of this metal are *cerite*, *cerine*, and *allanite*. Cerite is a pale dull red substance, slightly translucent, and having a specific gravity of 4.912. Cerine is a brownish-black imperfectly crystallized substance, with a slight metallic lustre, and a specific gravity of 4.173. Allanite is a crystal, in doubly oblique prisms; it is brownish black, opaque, slightly lustrous, and has a specific gravity of 4.000. All of these minerals contain silica and one of the oxides of cerium.

CERNE-AB-BAS, a market-town in the county of Dorset, 8 miles north of Dorchester, and 154 miles from London, being 4 miles from the Great Western station at Maiden Newton. The inhabitants are chiefly employed in malting and in the manufacture of gloves and parchment. It is named from an abbey founded in 987, some remains of which still exist. Population, 925.

CEROTIC ACID, or cerin of wax, an acid obtained from wax by boiling it in alcohol. It is soluble also in ether. It is a colourless crystalline substance, melting at 78°C. (172° Fahr.). The formula is $C_{27}H_{54}O_2$. It forms salts called cerotates.

CEROXYLON ANDICOLA, the wax-palm of South America, is one of the most remarkable plants in the large order of **PALMS** to which it belongs.

It has received from the American Spaniards the name of *Palma de Cera*, or wax-palm, on account of the abundance of that substance yielded by the stem. It grows in that part of the Andes which separates the valley of the Magdalena from that of the Cauca River, in 4° 35' N. lat. Below the snow-capped mountains called Tolima, San Juan, and Quindiu, especially the last, the ceroxylon grows in all its grandeur, elevating its majestic trunk, coated with a thick incrustation of wax, to the height of 180 feet, among the most rugged precipices of the wild region which it inhabits. This species avoids the heat of tropical plains, and seems incapable of existing except in regions where the temperature is lowered by elevation in the air, and the continuity of perpetual snow. It does not extend over more than 15 or 20 leagues of country altogether; its roots are fibrous and very numerous, the main root being thicker than the stem itself. The trunk is distinctly marked by rings caused by the fall of the leaves, which are from 18 to 20 feet long. The spaces between the rings are pale yellow, smooth like the stems of a reed, and covered with a thick coating of wax and resin. This substance, melted

with a third of fat, makes excellent candles. Vauquelin ascertained that this vegetable matter consists of two-thirds resin and one-third wax, which is only a little more brittle than bees'-wax. The genus *Ceroxydon* belongs to the tribe



Wax-palm (*Ceroxydon andicola*).

Areceæ, and is distinguished by the flowers being monœcious on different spadices, or polygamous; the male flowers unsymmetrical, sepals three-toothed, and from nine to fifteen stamens; the female flower with valvate petals and three-celled ovary; and the one-sided fruit with stigmata at the base.

CERTHIADÆ. See CREPES.

CERTHIOLÆ (*Certhiola faricola*) belongs to the division TENCUIROSTRES, of the order PASSERES. This bird, to which the name Banana Quit is sometimes applied, is an inhabitant of tropical South America and the West Indian Islands, where it appears to be abundant. Its general colour is ashy-gray, but the head is blackish, with a white streak over each eye, united behind the head. The anterior part of the wings is marked with bright yellow, and the rump, breast, and abdomen are yellow, becoming grayish towards the vent. The length of the bird is about 4½ inches. The certhioliæ is called the *Sucrier* in Cayenne, from its frequenting the sugar-canes for the sake of their sweet viscous juice; it also haunts flowers, partly in search of their nectar, and partly for the insects contained in them. It is said to have a short but agreeable song. During the greater part of the year it is a very solitary bird, and even during the breeding season usually endeavours to keep all its fellows from the place which it has selected for its dwelling. Its nest is suspended at the extremity of the most flexible twigs, and it usually selects for this purpose those which hang over the middle of a brook. This bird is said to seek the neighbourhood and protection of the formidable brown wasps, building its nest in close contiguity to the paper nests of those creatures. The nest, which is exclusively the work of the female, is constructed of moss, dry vegetable fibres, and the cotton and down of plants. These materials are so closely interwoven, and so strongly attached to the supporting twig, that the whole must be broken to pieces if it be desired to remove it without cutting the twigs. The entrance is from below, and the nest is divided vertically by a partition into two chambers, one of which serves as a sort of staircase to enable the bird to ascend to the top of the nest, whence it then descends into the second chamber, which has no direct communication with the exterior. In this chamber the

female lays her eggs and performs the business of incubation, sheltered from all her enemies; security is still further provided for by the male keeping watch in the outer chamber of this ingeniously constructed dwelling.

CERTIORARI (Latin, to be certiorated, or more fully and accurately informed of) is a writ issuing from one of the superior courts, directing the judges or officers of an inferior court to transmit or cause to be certified (*certiorari facias*) records or other proceedings. The object of the removal is either that the judgment of the inferior jurisdiction may be reviewed by the superior court, or that the decision and the proceedings leading to it may take place before the higher tribunal. The 5 & 6 Will. IV. c. 33 and 16 & 17 Viet. c. 30 enacted that no certiorari should issue to remove indictments to the superior court at the instance of a prosecutor, without leave obtained from that court, as by a defendant. In order to avoid the occurrence of frivolous appeals, it is usual, in statutes which give summary jurisdiction to inferior tribunals, to restrict, or altogether take away, the right to a certiorari.

CERUMEN (ear-wax) is a bitter yellow adhesive substance secreted by the skin of the deeper part of the external ear, in the same way and by similar organs as the sweat of the body in general. Its function is to protect the drum of the ear, and to collect any small foreign bodies that may penetrate the tube of the ear from without. If it is secreted too freely it causes deafness, but it is quite easily removed by softening the mass with a drop of glycerine for a day or two, and then gently syringing it out with warm water.

CERUSE or WHITE LEAD. See LEAD.

CERUSITE, or WHITE LEAD ORE, is, when abundant, a valuable ore of lead; it is the carbonate of that metal ($PbCO_3$), and is usually found associated with GALENA, from which it is probably derived. It crystallizes in the rhombic system, usually as right rhombic prisms, often in compound or twinned crystals; the hardness varies from 3 to 3.5, and the specific gravity is 6.4.

CERVANTES SAAVEDRA, MIGUEL DE, was born in the small but once flourishing city of Alcalá de Henares, about 20 miles from Madrid, on the 9th of October, 1547. His boyish years were characterized by that insatiable thirst for knowledge that usually distinguishes the youth of eminent men, and his love of reading was evinced by his collecting even the scattered pieces of torn paper which he found in the streets, so as to draw from them some food for the ever-craving necessities of his growing intellect.

In 1570 we find him acting in the capacity of chamberlain at Rome to the prelate and nuncio, Monsignor Acquaviva, who subsequently became a cardinal. In the following year Cervantes volunteered as a private soldier in the holy league against the common foe of Christendom, the Turk, and lost his hand in the memorable sea-fight of Lepanto, on the 7th of October of that year. With the rest of the wounded in that famous action he was carried to Messina, in the hospitals of which place he continued till April, 1572. On being able to resume active service, he immediately joined the expedition of Mark Antonio Colonna to the Levant, the most memorable result of which otherwise unsuccessful expedition was the story of the captive in "Don Quixote," which the poor maimed soldier founded upon it. In the next year he was again under the command of the hero of Lepanto, Don John of Austria, at Tunis, and in the subsequent three or four years saw much of Sicily and Italy, particularly of Naples, where he resided more than a year. On his being discharged in 1575 he determined to return to Spain, but on the way thither his ship, *El Sol*, was captured by pirates, and he and all on board were carried prisoners to Algiers. He was sold as a slave, and continued for five years in this condition,

going through adventures and trials more romantic and dangerous than any he had previously experienced. After his liberation he again entered the army, and served in the newly-acquired kingdom of Portugal.

After his marriage in 1581, he appears to have settled at Madrid, and commenced writing for the stage. Of his plays only two are known, and at the time they were so unsuccessful that their author determined to leave Madrid in 1588. He went to Seville, and there served in several humble employments, among others as a collector of debts. It was in prison, probably for debt, a frequent experience of poor Cervantes, that he commenced writing the first part of "Don Quixote," published in 1605, making the village in which he had been so badly treated the scene of the knight's insanity and misfortunes. In 1613 he published his "Novelas Exemplares," or moral tales, a charming book, for a long time little less popular than his "Don Quixote." In 1614 appeared his "Journey to Parnassus," a satirical poem, written in *terza rima*, the most interesting portion of which treats, in a light and cheerful spirit, of his own earlier writings. The second part of "Don Quixote" appeared in 1615, and is generally considered better even than the first. "Cervantes is indeed the poorest of all humorists; so small and timid, so full yet so ethereal; his humour, and in such accordance with his mind and his whole noble nature" (Calybe, "Biographer"). He died on the 23d of April, 1616, on the same day, nominally, as Shakespeare; in reality ten days before him, England still using the Old Style, while Spain and all Catholic countries already used the New. See CALENDAR.

The editions of "Don Quixote" in Spanish are almost innumerable, the best being the magnificent edition printed by the Spanish Academy (Madrid, 1780, four tom. folio). There are several translations in English of "Don Quixote," of which perhaps that of Mr. Motteux is the most spirited. The translation of Leake is used in the magnificent edition illustrated by Gustave Dore with drawings as fabulous as the text (London, 1866).

CESENA, a town of Central Italy, in the province and about 12 miles S.E. of the town of Forlì, at the foot of the Monte Garipio, one of the Apennines, on the Savio. Its chief buildings are the cathedral, the Palazzo Pubblico, a church founded by Domenico Malatesta Novelli in 1452, containing a valuable collection of MSS., and numerous monastic establishments. The ruins of a castle said to have been built by the Emperor Frederick II. stand near the town. Cesena is the birthplace of two popes, Pius VI. and VII. It has manufactures of silk and a trade in wine. There are sulphur mines in the neighbourhood. Cesena was one of the first of the cities of the Romagna to revolt from the Papal government in 1859. The population in 1882 was 25,225.

CES'SIO BONORUM, in the law of Scotland, is the name given to a process by which the estate of an insolvent person is attached and distributed among his creditors, and he is liberated and protected from imprisonment. The term is derived from the word *cessio*, or the assignment by which, as the counterpart of the relief afforded to him from the immediate operations of his creditors, the insolvent assigns his whole property to a trustee for their behoof. The trustees, like those in sequestrations, are under the supervision of the court in bankruptcy. The debtor has the privilege of retaining his working tools, but nothing beyond what is necessary for mere aliment is allowed. But the nomenclature and the early practice of the system are taken from the Roman law, where it was known as *the lausantabile remedium*.

CES'SION. When an ecclesiastical person accepts a second benefice or dignity in the church which is incompatible by law with that which he previously held, the latter is said to be void by cession. This avoidance takes place upon the acceptance of the second benefice.

CES'TUS, the covering of the hand and arm worn in a fierce sort of boxing known to the ancients. It was composed of leather thongs in heroic times, as, for instance, in the Iliad; but afterwards a box of metal was held within the fist, and the binding thongs were loaded with studs of metal, inflicting dreadful wounds. A combat with the cestus is vividly described in Virgil's *Æneid*, lib. vi.

CETA'CEA is an order of MAMMALIA including the WHALES and DOLPHINS. Of this class the members of the order Cetacea display all the essential characters of other mammals, though they differ so much from them in external form. The similarity in form and habitat to fishes has caused their true nature to be overlooked by



the unscientific, and even now they are popularly called "whale fish."

These animals have no hind limbs, and the fore limbs are fin like and without nails. There is a tail fin, which is horizontal, and not rayed like a fish's. In a few species a dorsal fin is present. The nostrils, or "blow holes," are situated on the top of the head. The pelvis is rudimentary; there is no sacrum. The body in the adult is usually smooth; the stomach is complex, divided into three or four cavities. In the accompanying figure of the stomach of the BELUGA, A represents the œsophagus; B, C, D, and E, the four cavities, and F the duodenum. The two mammae are situated on the groin. Sometimes teeth are altogether absent, except in the fetus, being replaced in the adult by plates of baleen or whalebone.

The order Cetacea is divided into the following families: —1, Balænopteriidae (BOUQUIN); 2, Balæniidae (true or whalebone WHALES), represented in Plate II. by the Greenland or Right Whale, *Balæna mysticetus*; 3, Physeteridae (SPEAR WHALE)—see fig. 2, Plate I.; 4, Monodontidae (NARWHAL)—see fig. 1, Plate I.; 5, Hyperoodontidae (BOTTLE-HEAD WHALE); 6, Delphinidae (the DOLPHIN family), represented in Plate II. by the Common Dolphin, *Delphinus delphis*; 7, Zæglodontidae, containing only one genus, found in the Eocene and Miocene deposits of North America, and differing from all other members of the order in having molars with two fangs.

CETIN, the crystallizable fatty matter which forms the greater part of the substance called spermaceti. It is white, crystalline, soft to the touch, and friable; it is nearly inodorous, and tasteless; it fuses at 49° C. (120° Fahr.), and

distill unchanged at 360° C. It is insoluble in water, but soluble in alcohol and ether. It contains carbon, 80.03; hydrogen, 13.25; oxygen, 6.72.

CETRARIA ISLANDICA. This lichen, commonly termed *Iceland Moss*, is a native of the higher mountains of Britain, northern Europe, America, and Asia, extending as far south as the Himalayas and Carolina. It is also found at Cape Horn. Sweden is the only country that exports it, but it is collected for local use also in Switzerland, Spain, and Iceland.

When dry it has scarcely any odour, and its taste is bitter and unpleasant. The powder or flower is of a whitish grey. When the bitter principle is removed, the starchy matter differs from wheat flour in nutritive properties, though Olsson asserts that a soup prepared with it is twice as nutritious as one made with flour. Certain it is that the inhabitants of Norway, Lapland, and, above all, of Iceland, use it extensively as an alimentary substance, the latter regarding it as the gift of "a beautiful Providence, which sends them bread out of the very stones." Unless steeped it is offensively bitter, and to many persons purgative; hence it was formerly called *Lichen catharticus*.

The excellence of Iceland moss depends upon its freshness and freedom from accidental impurities, which should be carefully removed before it is used. In its natural state it still containing the bitter principle—it is tonic, stomachic, febrifuge, and demulcent. It has acquired a high reputation, not merely as an article of diet, but as a medicinal agent in consumption. It has, however, no claims to confidence in that disease.

The genus *Cetraria* belongs to the lecidineous LICHENS, and is distinguished by the fructification, which is not pedate, being fixed laterally to the borders of the thallus.

CETRARIIC ACID or **CETRARIN**, an acid found in a lichen called Iceland moss (*Cetraria Islandica*), and owing the bitterness to this substance. In making jellies it is usual to separate it by maceration in cold water, to which a little carbonate of sodium is added. It forms colourless crystalline needles, insoluble in water, and having a very bitter taste; and also yellow salts called cetrarates. The formula is $C_{12}H_{10}O_8$.

CETTE, a flourishing seaport town in the department of Hérault, in France, is built on the slope and at the foot of a hill (the ancient *Monte Sctius*) on a tongue of land between the Etang de Thau and the Mediterranean, which are united by a canal that runs through the town and terminates in the harbour. It stands at a distance of 122 miles south from Paris, and had 31,000 inhabitants in 1882.* The town owes its prosperity to the mole, which was commenced in 1866, and which, extending 656 yards into the sea, shelters the harbour from the south and south-east winds. The depth of water within the harbour is 19 feet, and there is room enough for 100 vessels. The entrance is defended by a citadel and two forts. The town, which is entered by a causeway raised above the Etang de Thau, and by a bridge of fifty-two arches, is well built, has tribunals of first instance and of commerce, a college, a public library, marine baths, new hospital for sailors, shipbuilding yards, and large salt works, for which the finest white salt is obtained from the Etang de Thau. The Church of St. Louis is the most remarkable building. Handsome quays extend along the banks of the canal. The importance of Cette is owing to its being an outlet in the centre of the great wine districts of the south of France, and to its communication with Bordeaux by the Canal du Midi (which enters the Etang de Thau at Agde, and may be said to enter the Mediterranean through the harbour of Cette), with Lyons by the Canal des Etangs, the Canal de Beaucaire, and the Rhone, and with Nîmes and Montpellier by railroad. The foreign commerce and the coasting trade of Cette are important and active; and it has extensive cod and oyster fisheries. The imports con-

sist of wool, raw cotton, corn, oil, colonial produce, hemp, timber, pitch, tar, iron, tallow, fish-oil, &c. The manufactured articles are—brandy, sugar, perfumes, corks, liqueurs, confectionery, great numbers of wine casks, &c. The exports consist of these articles, and of wine to the amount of 60,000 tons annually, besides almonds, dried fruits, dye-stuffs, and flour. Much of the wine of Catalonia, in Spain, is sent in disguise to England, the United States, and elsewhere, under the name of famous vintages; and Cette is most active in its reception and diffusion. The town was founded in 1666 by Louis XIV. In 1710 a small British force landed here from the fleet of Commodore Norris, in order to cause a diversion on the side of Spain, and effect a junction with the insurgents of the Cevennes, but afterwards had to retire.

CETTINJE or **ZETINJE**, the chief town of the state of Montenegro, situated on a small river in a narrow plain surrounded by mountains, at an elevation of 2470 feet above the sea, 17 miles E.N.E. of Cattaro. It is walled, and its chief buildings are the palace and monastery. It is the residence of the archimandrite and the bishop. It is in reality, though the capital of the state, little more than a village. Cetinje was founded by Ivan the Black towards the end of the fifteenth century.

CETUS (the Sea-monster) is one of the southern constellations of Ptolemy, representing the monster which is going to devour Andromeda. It is situated below Pisces and Aries, and a bright star in the head, called Menkar (α Ceti), comes on the meridian in January. It is usually drawn with a fish's head, two paws in front, and a curled fish's tail. It is figured in our Part of CONSTELLATIONS, the head in the Northern Hemisphere, the rest in the Southern. It crosses the external line of each hemisphere at the numbers II. III. The river Eridanus flows between its paws. The lovely variable star Mira (θ Ceti) occurs in this group. See VARIABLE STARS.

CEUTA (or, as it is locally called, *Schtua*), a town and important fortress belonging to the Spaniards, is situated on the north coast of Africa, at the eastern entrance of the Straits of Gibraltar, where a small peninsula, about 3 miles in length, juts out in a N.N.E. direction exactly opposite Gibraltar. The peninsula, which terminates in the Monte del Hacho, the ancient *Ibyda*, one of the Pillars of Hercules, is joined to the mainland of Africa by a narrow isthmus, on which the town is built. Ceuta is the seat of a bishop and of a governor, who has under him the other *presidios* or forts held by Spain on this coast, namely Penon de Velez, Alhucema, and Melilla, the latter of which is about 150 miles east of Ceuta, and has a good harbour. Ceuta is said to be the first place in Western Europe where paper was manufactured. It occupies the site of the Roman colony *Ad Septem Fratres*. The town was taken by the West Goths in 618. In 1415 it was taken from the Moors by John I., king of Portugal, and was secured by the Spaniards after their conquest of Portugal in 1580. In 1810 it was held by the English for a time. Population, 8000.

CEVADILIC ACID is obtained from cevadilla, the seed of the *Veratrum sabadilla*, and is also found in *Veratrum Album* and *Colchicum Autumnale*; it has the form of white pearly needles, and is soluble in water, alcohol, and ether; it fuses at 20° C. (68° Fahr.), and sublimes unchanged. Its salts are little known; all have the odour of butyric acid.

CEVADILLA, CEBADILLA, or SABADILLA. is the Spanish-American name for *Asparagus officinalis*, the seeds of which have become an article of importance, in consequence of their having been found to contain a considerable quantity of the alkaline poison veratrine. The plant is bulbous, with grass-like leaves. It is a native of Mexico, and is cultivated near Vera Cruz and other places on the gulf. *Asparagus* is nearly allied to the genus *Colchicum*.

CÉVENNES a chain of mountains which runs through France, connecting the Vosges Mountains with the Pyrenees. Cæsar calls it *Cevenna* ("Bel. Gal.," vii. 8). From Mont Luis, a summit of the Pyrenees in the department of Pyrénées Orientales, in France, a mountain range runs N. by W. through the department of Aude, separating the feeders of the Ariège, an Atlantic river, from those of the Aude, a tributary of the Mediterranean, and dips into the high plain a little west of Castelnaudary, near the summit level of the Canal du Midi. Immediately east of Castelnaudary the Lower Cévennes Mountains commence under the name of Montagne Noire, and run north-east through the departments of Hérault and Gard, sending forth numerous offshoots into those of Tarn and Aveyron, and dividing the basin of the Tarn from that of the Hérault. On leaving Gard the chain increases in height, and running N.E. by N. enters the department of Lozère, where one of its summits, Mont Lozère, attains the height of 4890 feet. From this point a ridge called La Margeride springs off towards the north-west, and unites the Upper Cévennes with the mountains of Auvergne. The Margeride Mountains divide the waters of the Tarn from those of the Allier; they attain the height of 4987 feet, and send out, amongst other branches, those of Levezon and Aubrac, which extend into AVALARON. Continuing in the same direction, the Cévennes cover nearly the whole of the department of Ardèche, from the south-west of which a ridge runs northwards through Haute-Loire, and divides the basin of the Allier from that of the Loire, while the main chain is the water-shed between the Loire and the Rhone. In the department of Ardèche, the Cévennes Mountains reach their culminating point in Mont Mézenc, which has an elevation of 5561 feet. Leaving Ardèche, the chain enters the eastern part of Haute-Loire, and, taking a northern direction, passes through the departments of Loire, Rhone, Saône-et-Loire, and Côte d'Or, where it meets a branch of the Vosges Mountains, and separates the feeders of the Seine and the Loire from those of the Saône. Thus through their entire length the Cévennes Mountains form the water-shed between the Atlantic and the Mediterranean. The eastern side of the chain has the most rapid descent; the western sinks gradually into the great plains of the south-west and the centre of France.

The whole length of the chain, as here estimated, is about 250 miles. It consists principally of granite; but basaltic lavæ, streams, extinct craters, and other evidences of volcanic action at some remote period abound in part of the chain. Gold dust is found in the granite deposits after glaciation, to which most of the rivers of the Upper Cévennes are subject. In some parts the rocks are calcareous, and contain grottoes and caverns of great extent. In the calcareous districts the disappearance of a rock (locally called an *aron*) for one or two miles is not uncommon. Talc and slate-clay are found throughout the western end, while towards the base considerable beds of roofing slates are found. The Cévennes afford abundant pasture for large numbers of cattle and sheep, and in some parts the higher summits are covered with forests of pine; chestnut also are produced in immense quantities, and form an important article of food and of commerce. On the lower slopes the vine and other fruit trees flourish. Game is abundant, and wolves are far from being rare. It is said that the destruction of the forests of the Cévennes during the reign of Augustus has very much affected the climate and vegetation of the large and rich tracts of country near the mouth of the Rhone. Before this time they were protected from the north or north-west wind, and the olive and the orange flourished over a much larger extent of the country. Iron, lead, antimony, copper, coal, plaster of Paris, and marble are met with in various parts of the chain.

Cévennes is also the name of the country extending about the Upper Cévennes, and including the districts of VIVARAIS, VÉLAY, and GÉVAUDAN. The Cévennes district is famous as the scene of religious persecution, and for fierce resistance to it, up to a very late period. In this district the Albigenes and the Waldenses suffered as early as the twelfth century. After the Revocation of the Edict of Nantes persecution caused a general rebellion, and the nature of the country enabled the Camisards to maintain the struggle with the king's troops for a long time. The contest only ceased with the desolation of the province. Many of the Irish officers and soldiers who fought at the battle of the Boyne on the side of James II., and afterwards accompanied him to France, were employed here against the Protestants. During the insurrection the Cévenol leaders were encouraged by the ministers of William III. and Queen Anne, and on two occasions British fleets, under Sir Clondesley Shovel, approached the coast of Languedoc to support the insurrection with troops and arms, but failed in effecting their purpose.

CEYLON, an island which lies to the south of the peninsula of India, between $5^{\circ} 55'$ and $9^{\circ} 51'$ N. lat., and $79^{\circ} 41'$ and $81^{\circ} 51'$ E. lon. It is separated on the north-west from India by Palk's Strait and the Gulf of Manaar. Its extreme length is 270 miles from north to south, and its extreme breadth 156 miles. The circuit is about 750 miles. Its area is about 24,451 square miles. The straits between the island and the mainland of India vary from 40 to 60 miles in width, but the passage is rendered very difficult to navigate by a narrow chain of low coral reefs and sandbanks known as ADAM'S BRIDGE. Through this singular natural barrier vessels can only pass by two narrow channels, the Paumban and Manaar Passages. The Mohammedans believe that when Adam was driven out of the paradise of Ceylon he left it by this chain of reefs.

Physical Features.—The surface consists of a low maritime belt fringed with palm-covered islets and coastal lagoons, encircling an interior table-land, the elevation of which has given it the climate and varied productions which make the island the most magnificent and delightful of the East—"the resplendent," "the jewel of the Eastern seas," and "the gem of paradise." The lower ranges present verdant slopes; luxuriant forests, overhung by creepers, cover the higher hills; tree-ferns and gigantic rhododendrons next appear, and the innermost peaks shoot up bare and rocky in fantastic forms. Deep and narrow gorges, radiating from the central valleys, and intersecting the hills and the bordering edges of the table-land, are the channels for numerous mountain streams, which form, in their descent from level to level, a vast number of cataracts and cascades, whose copious waters, fed by countless perennial rills, hidden amid the thick foliage, fill the forest shades with a ceaseless and delightful murmur. Having reached the plains, they form placid rivers; and a few become navigable for small barges to a considerable distance from their mouths. The highest mountains in the island are Pedrotallagalla, near Newera Ellia, 8280 feet; Kirrigal Pota, 7810 feet; Totappella, 7720 feet; Adam's Peak, 7420 feet; and Nanima-Cooli-Kandy, 5548 feet.

The maritime belt is from 8 to 30 miles wide, reaching to 80 in the north. It is mostly clad in the richest green, and contrasts favourably with the parched plains of Southern India. The S.E. coast is bold and rocky, from the approach of the declining offsets from the table-land; and the E. coast has generally deep water and good harbours. From Colombo northwards the W. coast can only be approached by vessels of 100 tons. Numerous islets, and long, narrow, and low peninsulas, inclosing lagoons, skirt the coast, and, being covered with palms and other fine trees, they give a singularly picturesque character to much of the coast scenery. The rise of tide is only 3 or 4 feet.

The island abounds with mountain streams and rivers.

The rivers are more numerous on the south and south-west than on the north-east side. Those which flow through the districts on the east and north formerly filled the numerous tanks which rendered these districts the most fertile and populous in the island. These districts, now deserted and overgrown with jungle, contain remains of numerous works for conducting and distributing the waters. The principal rivers are the Mahawelli-ganga (the Ganges of Ptolemy), the Kalany, the Kalu-oya, and the Wellawey, all of which rise in the central mass. The Mahawelli-ganga, after a course of about 134 miles, falls into the Bay of Trincomalee. All four are navigable only for boats and rafts. There are lagoons near Nilla-velle and Batticaloa, and at a few other spots. Artificial lakes and canals, for the purpose of irrigation, were formed by the Singhalese at a very remote period. There is one canal for traffic, between Colombo and Calpentin. The ocean currents which sweep around the coast have occasioned the formation of extensive salt-water lakes, or lagoons, which, by means of the channels connecting them, facilitate the communication of the maritime districts.

The country being intersected by deep ravines, often

impassable, and covered with thick jungle, the communications are rendered extremely difficult. Under the Kandyan government the opening of roads was prohibited, and the passes were strictly guarded. Narrow paths were made, by which men on foot could pass singly, climbing over the rocks and through the thickets. But since the occupation of the country by the British, a fine system of carriage roads and some railways have been constructed at a vast expense, and with very great advantage to the colony.

Climate, Soil, Productions. The climate of Ceylon is principally influenced by the two monsoons, of which the N.E. blows from October to May and the S.W. from June to September. During much of this time variable winds and calms prevail. The seasons are, however, subject to fluctuation, the south-west wind being generally more prevalent. Sometimes, indeed, at Colombo this wind blows for five months together, and the north-west wind blows during the months of December and January only. Local circumstances modify the winds of the interior according to the distance from the east and west coasts. The heat is not so great as on the neighbouring coast of India, the sea breezes moderating the temperature, and making the air here



Ruins of the Brazen Palace.

agreeable and salubrious. The rains are sometimes very heavy. The northern part of the island may be characterized as hot and dry, the western and eastern as temperate and humid. Several years ago, from the mortality among British troops who had seen hard service, it was thought that Ceylon was an insalubrious island; but a better knowledge of the country has led to a more favourable opinion.

Among the minerals are iron, manganese, plumbago, nitre, alum, salt, and gems. There are several hot springs in the island. Quartzose gravel or sand, and felspathic clay, mixed with oxide of iron, derived entirely from the decomposition of the prevailing rocks, generally compose the soil of Ceylon.

The ancient inhabitants appear to have been skilful in the execution of works for the collection and distribution of water, the most remarkable of which are the spacious tanks embanked in the plains, and the dams constructed across the beds of rivers, or over ravines and valleys connecting small hills, and thus forming extensive lakes for flooding the plains in the driest season. Among these works are the artificial lakes of Kanthalai and Mineri, and

the incomplete basin of the Giant's Tank. The Lake of Mineri is said to have been founded in the third century (275 A.D.) of the Christian era. These vast works were executed for the improvement of lands which were probably distributed among the people employed in the work, who dedicated a portion of their revenues to the temples and priesthood. Most of these works had been allowed to fall into decay, but since 1877 much has been effected in the way of a restoration of many of them, and with the happiest results. An immense profit is now derived from a very trifling outlay upon the repair of Kanthalai, a task so enormous that it is calculated it would cost a million sterling to erect such works in the present day.

Among the rich and varied products of the vegetable kingdom the most valuable are coffee, cinnamon, and cocoa-nut. The cultivation of the former has increased greatly of late years. The plantations are situated upon the lower terraces of the table-land, at a considerable elevation, the zone from 1000 to 2500 feet being best adapted to its growth. The cinnamon plantations occupy a space of about 12 miles in circumference, near Colombo,

where the required conditions of temperature exist. The coco-nut palm (*Cocos nucifera*) flourishes vigorously on most parts of the S. and W. coasts, often so near the sea that the roots are washed by the waves, and its dispersion to distant lands is thus rendered easy. The coco-nut oil and a resin called dammer, when mixed together, form a substance used for the same purpose as oakum, for paying the seams of ships and stopping leaks. Tea of excellent quality is grown, and cinchona thrives vigorously, and its cultivation is rapidly extending. The Palmyra and Talipot palms, bread-fruit and jack trees, areca nut, tobacco, indigo, tamarind, cotton, rice, pepper, and a great many trees whose wood is useful for the best kind of cabinet-work, are other important vegetable products, besides vast numbers of plants ornamental in the hothouse.

The quadrupeds of Ceylon are for the most part like those of the opposite continent. Elephants are very numerous throughout the whole island, and were formerly destroyed by thousands annually, both for sport and for the ivory.

The wanton slaughter of these extremely useful animals led the government, in 1875, to prohibit their destruction except under special circumstances. The elk, the fallow-deer, the moose-deer, the hog, a small species of bear, and snakes, are among the animals of Ceylon.

The pearl fishery is a remarkable feature in the industry of Ceylon. The chief pearl-banks are at Condatelty, and measure about 30 miles by 20. There are from 1000 to 2000 divers employed for about three weeks in spring. The pearls obtained are sold to the highest bidder, and the diver has a certain share of the profits.

History and Government.—Onesieritus and Nearehus, commanders of the fleet despatched by Alexander from the Indus to the Persian Gulf, brought the first accounts of the island to Europe. Through a diplomatic mission which came to Rome from Ceylon in the time of Claudius, particulars were ascertained by Pliny respecting its towns, population, and extensive trade, from which it appeared that the island was then in a very prosperous and highly



The Palace at Pollanarua.

civilized state. It was visited by merchants in the sixth century, by Marco Polo in the thirteenth, and by Ralph Fitch, an Englishman, in the sixteenth.

The Chinese annals extant contain an uninterrupted historical record of events for twenty-four centuries, according to which their first king, Wijayo, founded his kingdom by the subjugation of the original inhabitants about 543 B.C., and their last king, Sri Wikrama Raja Singha, was deposed by the British in 1815. Recent evidence of the authenticity and accuracy of these writings has given a new value to them. Many of their descriptions of towns and buildings and other works of art have been tested by an inspection of the now existing ruins, and the evidence thence drawn has been confirmed by deciphered ancient inscriptions.

Of the ruins the most interesting, and by far the most colossal, are those connected with religion. For example, the sacred mountain of Mihintala, due to the ancient city of Anurajapoora, is covered from base to summit with temples, statues, and monuments, and the highest of the peaks reached by flights of stone stairs leads from the living

rock. Statues of Buddha are to be seen in numerous localities, so vast in their dimensions that some of them exceed 50 feet in height. One of the most remarkable stands in the open air near the Aukana Wihare. It is carved from a rock of gneiss, and forms a singularly solemn feature in the solitude of the forest.

Of the royal palaces but few fragments remain. Of these the most ancient and the most interesting are the ruins of the Brazen Palace at Anurajapoora—a building which stood on monoliths of granite, multitudes of which still remain, and derived its name from the metal with which it was roofed.

Much more modern, as well as more beautiful in design, is the palace at Pollanarua, erected about the twelfth century. The stone of which it is constructed is so solidly put together, that even the roots of the fig-trees which grow upon the walls have only partially dislocated the masonry, and stream downward to the ground, as though the wood had been consolidated from a state of fluidity.

Of European nations the Portuguese first established a regular intercourse with Ceylon. The island being torn by

internal wars, and invaded from Malabar, the king purchased the assistance of the Portuguese with a stipulated annual tribute of 250,000 lbs. of cinnamon. The Portuguese gradually gained a footing in the island, and at length, in 1520, strongly fortified themselves at Colombo, whence they subjected the whole of the maritime districts, and retained possession of them for about 150 years. The Dutch aided the Kandyans to expel the Portuguese in the middle of the seventeenth century, and then gradually aimed at acquiring the whole island. At the close of the eighteenth century, after various encounters between the Dutch and the French, the British obtained possession of much of the coast; and in 1815, at the invitation of the chiefs, who were disgusted with the tyranny of their king, the British took possession of the whole island.

Since the British conquest of the interior the capital of the hill country has been Kandy, which is situated in the

midst of the lofty mountains where the valuable plantations of coffee have been formed. Kandy was not one of the ancient capitals, having only become the seat of government so late as the fourteenth century. At a later period Badulla, now also one of the centres of coffee cultivation, was the residence of some of the minor sovereigns while the dynasty was rapidly undergoing decline. The situation is unsurpassed in loveliness and salubrity; but the city retains few traces of its ancient importance.

Under a native king the government of Ceylon was strictly monarchical. He was proprietor of the soil, regulator of the feudal payments and services, and distributor of all public honours and emoluments. The services of all were rewarded with certain privileges or possessions. The head man of each village, to whom the people immediately referred, directed the labour of the people under the authority of the provincial chief. But the superintendence of



Kandy, from the Western Redoubt.

agriculture was the duty of a particular class of persons, who attended to the embankments of tanks and canals and to the distribution of water.

The ancient kings had certain monopolies of cinnamon and other produce, which the Portuguese and the Dutch maintained with such severity as to press sorely on the labouring classes. The British gradually removed all these monopolies, and by the year 1832 the labourers were enabled to apply their industry in new fields. Various improvements, moral, political, and commercial, have been introduced, which have raised the Cingalese to a far happier position than they had occupied during the previous three centuries.

The administration of the colony is now vested in the hands of a British governor, assisted by an executive council of five members—viz. the officer commanding the troops, the colonial secretary, the queen's advocate, the treasurer, and the auditor-general; and a legislative council of fifteen

members, including the members of the executive council, four other office-holders, and six unofficial members. All laws before being acted upon are published in the official gazette, with translations into the Cingalese and Malabar languages. By recent regulations any persons judged to possess sufficient qualifications (among which is a knowledge of English) may fill the most important offices in the civil service without reference to nation or faith. Each village and caste has its elected headman, who is recognized by the government, which commonly selects its native servants from among this class of people.

A supreme court of justice is established at Colombo, with powers equivalent to the Court of Queen's Bench and the Court of Chancery. It is presided over by three English judges, aided by two other functionaries, all of whom are appointed from England. Exclusive of Colombo, the island is divided into three circuits, which are again subdivided into districts, each of which has its own court,

with a judge and three assessors. Trial by jury is universal throughout the island. There is a regular police force modelled on that of London.

Population, Religion, Education, Language, &c.—The *Cingalese* inhabit the interior and parts of the coast, and comprise the great body of the people. The civil distinctions of caste are strictly observed, but the religious distinctions have been abolished. The higher orders have a proud and lofty idea of their importance, and carefully abstain from intermarriage with lower castes. The *Cingalese* are characterized as honest, sober, polite, obedient, and affectionate. In the northern districts the *Tamils*—descendants of invaders or immigrants from Southern India—are a superior people, and have become familiar with the advantages of English education. Not a few have shown themselves accomplished in mathematics, mechanics, and jurisprudence. The tribe called *Veddhas* are small in number, inhabiting secluded parts of the interior, and very little better than savages in their social state. The *Malabars*, who occupy the north and north-east parts of

the island, are descendants of those natives of India who invaded the country many years ago. They resemble in many points the *Malabars* of Southern India, but are rapidly acquiring European habits. The *Moormen* are descendants of those who have arrived from neighbouring islands and states; they engross a large proportion of the commerce and traffic of the island. The *Europeans* and the *Negroes* are comparatively small in number.

The estimated population in 1881 was 2,822,000. Of this number 4100 were British, 17,866 other whites of European descent, and the rest coloured. The male sex preponderated over the female.

The natives of Ceylon have been, and remain, among the most steady adherents to Buddhism. The temples were formerly very numerous and magnificent; in one of them the most highly-prized relic, the tooth of Guatama, was preserved; it is even claimed to be there still, but what is shown is believed to be only an imitation. In another yet venerated, and a resort of pilgrims, is the alleged impression of Guatama's foot on the top of Adam's Peak. The



Badulla.

most venerated and holy object of Ceylon, however, is the sacred Bo-tree, the now aged growth of a cutting taken 150 years ago, from the Bo-tree at Gaya, in Bengal, under whose shade Guatama is said to have attained the Buddhahood. See BUDDHA.

There are several Protestant churches in the island, subordinate to the Bishop of Colombo, and a large number of dissenting places of worship. Roman Catholic chapels are also numerous. Christianity is supposed to have been introduced into Ceylon by Nestorian missionaries in the sixth century. It afterwards became blotted out, and was reintroduced by St. Francis Xavier in the sixteenth century.

The *Cingalese* language is peculiar to Ceylon, but their classic and sacred writings are either in Pali or in Sanskrit. The *Malabars* use the Tamil. Both *Cingalese* and *Malabars* have many historical and sacred books in their respective languages.

For the progress of education the island was for a long time indebted chiefly to the religious societies and the exertions of the missionaries. There are now, however, some well-conducted government schools, and in them the children of parents of all faiths receive instruction together,

without any objection being raised on the score of religious scruples, and English is almost universally taught.

Trade and Commerce.—We have historical proof that, from the Christian era until the beginning of the sixth century, Ceylon was the emporium of the trade carried on between Africa, India, and China. The Romans, until the decay of their empire, traded extensively with India and Ceylon, the latter place being the usual limit of their navigation, where they exchanged their gold and silver, the chief instruments of their commerce, for the silks, fine cloths, and costly commodities of Eastern India and China. The Persians and the Mohammedan Arabs in later times conducted an extensive commerce with Ceylon. The miserable spirit of monopoly which characterized the Portuguese and Dutch occupation of Ceylon greatly injured the commercial development of the island, and it has required liberal and long-continued exertions on the part of the British to put it in a fair way to prosperity.

Both the exports and the imports have enormously increased since 1850, in which year they were only £1,246,956 and £1,188,678 respectively. The imports now exceed £5,600,000 per annum, and the exports are valued at about £1,500,000. The advance has been

Gradual. The principal imports are, cotton manufactures, hardware, and specie from England, and rice from India. The exports are, coffee, cinnamon, cocoa-nut oil, cinchona bark, tea, plumbago, spirits (arrack), and tobacco.

The commercial intercourse of Ceylon with the United Kingdom is shown in the subjoined tabular statement, which gives the total value of the imports and exports in the years 1881 to 1884:—

Years.	Imports from Ceylon into the United Kingdom.	Exports of Home Produce from the United Kingdom to Ceylon.
1881, . . .	£2,136,400	... £807,000
1882, . . .	2,413,670	... 728,611
1883, . . .	2,175,512	... 725,017
1884, . . .	2,397,364	... 738,067

Formerly coffee was the staple export from Ceylon, but owing to disease among the coffee plants its production has greatly fallen off in recent years. Tea, however, is now largely cultivated, and £86,000 worth was exported in 1883. The other articles of note are, cocoa-nut oil, cacao, cinchona bark, cinnamon, and plumbago. Manufactured cotton goods form the principal British export.

The progress of the colony within recent years has been very remarkable. The extension of its commerce is mentioned above. The revenue is about £1,200,000 per annum, and the expenditure usually somewhat under the receipts. The public debt incurred for railways and public works amounted in 1881 to £2,124,108; 112 miles of railway, costing £2,500,000, are the property of the colony. The government has reorganized almost all the important departments, and included a large number of natives in the public service. Among public works is a great break-water at Colombo, which will probably become a vast commercial city—the half-way house to the far East and to the Australian colonies. An open roadstead has been converted into a port of perfect safety and shelter at all periods of the year, with jetties, alongside of which the largest ships can place themselves. The extension of railways through the coffee districts has brought a large increase of business to the port. The introduction of the cane, or cultivation has proved a large source of profit to the island. Besides increased trade and the introduction of the railway, much progress has been made in other directions. Good roads have been made between the principal towns, bridges erected over rapid and unfordable streams, and improvements effected in various ways in the means of irrigation. By this latter enterprise tens of thousands of acres, which in 1871 were mere jungle, were in 1881 covered with fine plantations of rice, coffee, and cinchona. Much English capital has been introduced into the island, invited by the authorities having given free play to the operations of a legitimate commerce, the liberal principles on which the sale of waste lands are conducted, and an efficient police giving security alike to persons and property. Under the sound policy pursued by a series of enlightened and vigorous governors, native enterprise and industries have been stimulated, and the island is among the most prosperous of our colonies.

CHABAZITE is probably the most abundant member of the **ZEOLITES**, a group of minerals found plentifully in the cavities and fissures of amygdaloidal trap-rocks. It crystallizes in rhombohedrons (in the hexagonal system), which closely resemble cubes, and are often compound; they have usually a clear or pearly-white colour, but are sometimes reddish, with a vitreous lustre, a hardness of 4 or 5, and a specific gravity of about 2.

This mineral species is to be found plentifully lining the geodes in the basalts of Antrim and of Scotland, associated with other zeolites and **ARAGONITE**; they are not original minerals in these rocks, but are products of alteration of

some of the constituting minerals, and were formed while the rock was still hot, or during its cooling.

CHABLIS, a small town in the department of Yonne, in France, 10 miles E. of Auxerre, beautifully placed in the middle of vineyards producing the white wine of this name. Population, 2186.

CHACMA (*Cynocephalus porcarus*) is a BABOON inhabiting the mountains throughout the colony of the Cape of Good Hope, where, in the remoter districts, it is very abundant, and well known to the farmers from the devastations it commits on their cultivated lands. It associates in troops of 300 or 400 together, and travellers over the mountains describe the noise made by them, when they see loaded waggons intruding upon their territory, as something terrific. Should the travellers have to remain for the night in the vicinity of their habitations, the yells and howlings are kept up all night, so as to effectually scare sleep from the intruders' eyelids, and make them long for the first dawn to recommence their march. Occasionally, however, the chacmas take matters more quietly, sitting peaceably on the summits of the rocks and gazing down upon the train of waggons. Should they be within reach of the rifles of the travellers they scamble away immediately, climbing up the rocks by the help of certain creeping plants, which in many places form a network over the rocks, and from the use to which the chacmas put them are called by the Boers "monkeys' ladders." Their movements in such cases are very amusing, but they cannot always be observed in safety, for the baboons sometimes attack travellers by throwing stones down upon them.

The food of the chacma consists partly of fruits and bulbous roots, and it is customary for these animals to descend into the rich secluded valleys in quest of food. When suddenly surprised the cry of alarm is raised, and the troop ascend the rocky cliffs, often several hundred feet in height, with astonishing agility, the young clinging to the mothers and the old males bringing up the rear. Besides bulbs and grain these animals are very fond of eggs, and greedily devour scorpions, which they seize and nip off the sting with so rapid an action as to prevent their hands from being wounded. The devotion of the females to their young is very great, and they brave every danger in their defence.

Some idea of the risk in attacking one of these baboons may be conceived from the account given of their prowess by Mr. Burchell. On one occasion a small company of them, being chased by his dogs, suddenly turned round and defended themselves most effectually. One dog was killed on the spot by a bite through the great bloodvessels of the throat, and another was disabled in consequence of a lacerated wound which laid its ribs bare. Even the leopard, hyæna, and wild-dog are sometimes mastered by a troop of these animals, although the leopard, surprising individuals, destroys numbers.

From the account given by Le Vaillant of one of these baboons which was in his possession in Africa, they would appear to be good-tempered, amusing, and even affectionate; but these good qualities, in all probability, wear off in course of time, as the adult specimens which have been kept in menageries in Europe have exhibited all the ferocity and other disgusting qualities of their congeners.

The old male chacma is a large, powerful, and savage animal, and more than a match for two good dogs, being equal in size and superior in strength to the largest mastiff. About the shoulder and neck the hairs are long and mane-like; the general colour is dusky brownish-black, mixed throughout with a green shade, deepest on the head and along the ridge of the back, paler on the sides; the hairs generally are gray at the root, and then annulated with distinct rings of black and dark green. The skin of the face is black, with a hue of violet; the upper eyelids

are white. The tail is rather more than half the length of the body, and tufted at its extremity; it is carried elevated at the root, and then arched down, as the animal gallops along on all fours. From a fancied resemblance of this organ to that of a pig the chacma is sometimes called the Pig-tailed Baboon.

CHAD, ST., the modern corruption of Ceadda, the English-hearted missionary to whom the glorious fane of Lichfield is dedicated. His brother, St. Cedd, was a missionary too, and he came to be Bishop of London under Archbishop Theodore, at the time that St. Chad was Bishop, first of York and then of the wild Mercia, the centre of England, which after the death of Penda was just beginning to escape from the most savage heathendom. St. Chad was so lowly that it took the authority of the Archbishop to make him use a horse on his long mission journeys, wherein he converted all the middle of England. At his death it is recorded that an invisible choir of angels came singing down from on high, and having greeted him, so returned again; this and many other tales serve to show how the wild folk strangely loved their teacher. The date of the death of St. Chad is given as 2nd March, 673.

CHERONEA, an old city of Bœotia, on the borders of Phœcis, near the pass which led to Delphi by Panopeus and Parassus. It is celebrated as the site of two great battles: one in which Philip of Macedon defeated the united forces of Athens and Thebes; the other between Sulla and Archelaus, the general of Mithridates, in which the Romans gained a decisive victory, *b.c.* 86. The site is now occupied by the town of Capricna, or Capurno. It was the birth place of Plutarch.

CHÆTODON is a genus of fishes of the order ACANTHOPTERYGII and family SQUAMIPINNES. In these fishes the body is compressed, the mouth small and furnished with several closely set rows of long slender bristle-like teeth. The scales extend from the body on to the dorsal and anal fins, so that it is difficult to distinguish the line of separation of these organs. These fishes abound in the seas of hot climates, frequent rocky shores, and are adorned with beautiful colors. Their most common tints appear to be black and yellow, but brilliant metallic blues and greens of various tints are not unfrequent. Many of the species have a vertical black band, in which the eye is placed. In some there are several similar bands on the body; in others the body is spotted or marked with oblique or longitudinal bands. They have large gill-bladders; the gills are numerous, long, and slender. The flesh is accounted excellent. About seventy species of this genus are known from the tropical parts of the Atlantic and Indo-Pacific, being most numerous in the neighbourhood of coral reefs. A species of the genus is figured in the first Plate devoted to the ACANTHOPTERYGII.

CHAF FINCH (*Fringilla œolæba*) is a well-known member of the FINCH family belonging to the section COCTROPHIDÆ, of the order PASSERINÆ. The chaffinch has a wide range, and is abundant in all parts of Britain, where it is a permanent resident; in the colder regions of the north it is a migratory bird, passing southward at the approach of winter to seek a more genial climate for its residence during the cold season. At this time a considerable number of chaffinches visit our island. Linnæus states that in Sweden the female chaffinches migrate but the males do not, and the specific name (*œolæba*, or the bachelor) given by him to this bird is an allusion to the lonely condition of these deserted males. It appears, however, that all the females do not migrate southwards, although those that remain seem to collect into distinct bands and keep aloof from the males; this is the case also in the more northern parts of our own country, and female chaffinches are more numerous in the south of England during the winter than at other times.

The chaffinch resides in orchards, plantations, and hedges,

rows, and in the neighbourhood of these its note may be heard at a very early period of the year. It usually consists of a sharp repetition of a sound resembling the syllable *fink* or *pink*; from the former of these words the word finch is derived. The note of the chaffinch is generally a welcome sound, from its association with the early spring; and the gaiety and sprightliness of the bird render it an almost universal favourite, except, perhaps, with some gardeners, for whose early radish seed, sown at a period when food is probably rather scarce, it has so strong a predilection that it will be down upon the bed almost as soon as the seed is covered in.

The nest is built in the fork of some bush or tree, and is a neat structure composed of moss, adorned externally with fragments of lichens, and lined with wool, hair, and feathers. The eggs are usually four or five in number; their colour is pale buff, streaked and spotted with dark reddish-brown.

This well-known bird is much esteemed in Germany for its song. Indeed, according to Bechstein, the passion for this finch is carried to such an extent in Thuringia that some men have gone 90 miles from home to take with bird-lime one of those birds distinguished by its song, and have given one of their cows for a fine songster, whence has arisen their common expression, "such a chaffinch is worth a cow." An amateur cannot hear one that sings in a superior style "the double trill of the Hartz" without being in an ecstasy. The Germans distinguish the song of the chaffinch into different styles or kinds, to which they have given definite titles; such as the "Double Trill of the Hartz," the "Reiter Song," the "Wine Song," the "Bridgroom Song," the "Double Trill," the "Good Year Song," the "Quakia Song," and the "Pithia." We shall not attempt to describe these "songs and trills," for it would be impossible by mere words to convey a clear idea of their respective characters and peculiarities. In England the merits of the chaffinch as a songster are not appreciated.

The provincial names of this species are—spink, beech-finch, pink, twink, skelly, shell-apple, hen-finch, scabby, shilla, &c.

CHAILLETIACEÆ is an order of plants belonging to the division POLYPTERALE, the series Dicotyledonæ, and cohort Geraniales. From the other orders included in the same cohort it is distinguished by the five sepals, the petals being two-lobed, the disc cup-shaped or divided into two scales, the ovary entire, and the ovules two in each cell. The species are trees or shrubs, with alternate undivided stipulate leaves.

Chaillatia toricaria is used in Sierra Leone to poison rats, and is therefore called ratsbane. The wood of *Tapura guianensis* is used in Guiana for building.

CHAIN ARMOUR. See ARMOUR.

CHALA'ZA, that part in a SEED where the raphe passes from the exterior integument or primum, and expands into the secundine. In the common almond it is readily seen by turning the testa inside out, and observing that part which corresponds to the apex of the cotyledons. When the foramen of a seed is next the hilum the chalaza is most conspicuous; but when the foramen is at the apex of a seed the chalaza will then be in contact with the hilum, with which it must necessarily be then confused.

CHALCE'DON, properly **CALCHE'DON**, a town of Asia Minor, on the coast of the Propontis, and at the entrance of the Bosphorus, nearly opposite Byzantium. It was built by a colony from Megara, 675 *b.c.* The site was so plainly inferior to that on which Byzantium was built that the oracle named it the "city of the blind." It was taken by the Persians, retaken by the Athenians, then recovered its independence, and entered into a confederation with Byzantium and other neighbouring cities. It was afterwards subject to the kings of Bithynia, and finally to

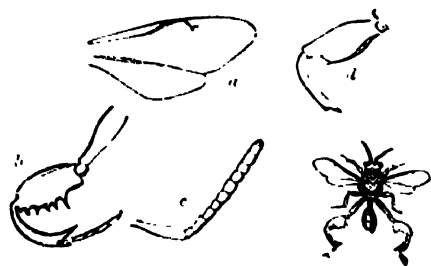
the Romans. Its ruin was completed owing to the use made by the Turks of the materials of its edifices for buildings in their city of Constantinople. Chalcedon is known for its council held A.D. 451, which was attended by 630 bishops from both the East and the West. It was the fourth œcumenic or general council of the church. The council condemned the heresy of Eutyches on the nature of Jesus Christ.

Chalcedon is now a poor village inhabited chiefly by Greeks, 2 or 3 miles south of Scutari, on the site of the ancient *Chrysopolis*.

CHALCED'ONY or **CALCED'ONY** is so called from Chalcedon, in Bithynia, whence it was formerly obtained; it is a translucent microcrystallized variety of QUARTZ, with an obscure or minutely crystalline (crypto-crystalline) structure, a waxy lustre, and varying much in colour, but usually pale grayish or bluish; the surface is generally mammillated or botryoidal, and is sometimes stalaetic. It is found usually filling cavities in amygdaloidal rocks, where it has probably been deposited from hot silicious waters. It was much used for sculptures among the Persians, Babylonians, Etruscans, Greeks, and Romans, and in the middle ages was the stone symbolical of St. James. There are many allied stones which have been grouped together, forming the *Chalcedonic varieties of quartz* (intermediate between the vitreous or crystallized and jaspery or crypto-crystalline varieties), and, according to Fuchs, composed of true quartz and disseminated opal. These varieties include CARNELIAN, or *sard*; PRASI, BLOODSTONE; *Chrysoprase*, an apple-green stone, coloured by nickel; AGATE; CAT'S-EYE; *Onga*, a kind of agate, the colours being arranged in horizontal layers (this stone much used for cameos; the blue and black variety was the second stone in the fourth row of the Jewish high-priest's breastplate); the *Sardonyx* was composed of red and white layers, and in the middle ages was symbolical of St. Philip. Besides these may be mentioned FLINT, HORNSTONE, CHERT, and PLASMA.

CHALCIDIDÆ is a family of hymenopterous insects, of the section PRHYVORA.

Nearly all the species of this group are exceedingly minute. Many of them are very brilliant, their colours consisting of various shades of green, blue, or copper-like hues; in some of the sections, however, black is the prevailing colour. The thorax is usually large in proportion to the body, and the latter is often of a compressed form, and joined to the thorax by a distinct long stalk, as in



Chalceis clavipes.

a, The wings; b, the hind leg; and c, antenna—magnified; d, hind femur and tibia of a species of *Donacia*.

Chalceis clavipes, which is one of the largest of the British species, measuring from tip to tip of the wings, when expanded, upwards of half an inch. This insect is of a dull black colour, and remarkable for the great development of the coxæ and femora of the hinder legs; the latter are of a reddish hue, and armed with eight little teeth beneath; the hinder tibiae are curved. It is found on the leaves of shrubs in marshy situations. The femur and tibia of

Donacia, a genus of the group PHYTOPHAGA of BEETLES, are similarly formed to those of *Chalceis clavipes*, and are obviously suited for clinging rather than leaping.

In *Chalceis clavipes* the ovipositor is short and hidden beneath the abdomen, a circumstance extremely common in this family; in some, however, the ovipositor is very long, equalling or exceeding the body in length. This is the case in the genus *Callimone*, a group the species of which have very brilliant colours, principally green, and deposit their eggs in the larvæ of the GALL-FLEES (Cynipidæ), an operation which their long bristle-like ovipositors enable them readily to perform. One of the most striking characters in the Chalcididæ is the wings, which are almost destitute of nervures.

The Chalcididæ are very numerous, England alone containing about 1500 species. They are all parasitic in their larval state. Some are so minute as to undergo their metamorphosis in the eggs of other insects. The chrysalis of a butterfly or moth not unfrequently forms the nest of an immense number of these little insects.

CHAL'CIS, the chief town of Eubœa (the island of Negroponte), was in ancient times a very important place, controlling the sea passage from Northern to Southern Greece, and famous also for its many colonies along the shores of the Mediterranean, so that a part of Macedonia was actually called Chalcidicæ. Cuma, in Italy, and Naxos, in Sicily, were colonies of Chalceis. It became connected with Athens, and shared the various changes of that country. Aristotle died at Chalceis.

CHAL'CIS is a genus of reptiles belonging to the order LACERTHIA, or lizards. In this genus the body is very serpent-like in form, being cylindrical and elongated. There are four legs, which are only in a rudimentary state; the hinder feet in some not being even divided into distinct toes. The ears are hidden under the skin.

The species *Chalceis flavescens* is about 2½ inches long, and is a native of tropical America. The scales of the body form very distinct circular rings. The legs are only about a line in length, and the fore feet are situated very near the head. Its colour is rather somber, the prevailing tint being brassy.

CHALCOP'YRITE, or copper pyrites, is one of the most abundant ores of copper, and commercially it is probably the most important. It consists of the mixed sulphides of copper and iron (Cu_2SFeS_2), which, when pure, contain about 34.5 per cent. of copper; but the ores of commerce do not contain more than from about 3 to 12 per cent.; of those sold at Swansea, 6½ per cent. of copper is about the average produce. This mineral is usually found massive in lodes or veins intersecting slate rocks, more or less metamorphosed; it is sometimes found crystallized in tetrahedra or octahedra of the tetragonal system; its hardness is under 4, and specific gravity about 4.2. The colour is brass-yellow; hence it is often spoken of as *yellow copper ore*. From iron pyrites it may be distinguished by its deeper colour and inferior hardness, being easily scratched by a knife, and when struck by a steel instrument giving a smooth streak, on which, when the specimen is rich, a thin film of copper is often discernible. From gold its non-malleability at once distinguishes it. This mineral is of almost universal distribution; it has been the chief source of copper in the British Isles, the principal mines being situated in Cornwall and Devon, also at Knockmahon, Beaulieu, and Ovea, in Ireland. In the Cornish district the lodes run about east and west, and where they have been followed in depth into the granite, the copper is found to be replaced by tin. See CASSITERITE.

Almost all the ore is shipped to Swansea, which is the great copper-smelting centre of the British Isles. Previous to being smelted, this ore is often used for the manufacture of sulphuric acid, the "cinders," after the sulphur

has been burned out, being sent to the copper-smelters. The soft variety of this ore, containing much iron pyrites, become oxidized rapidly; their spontaneous decomposition gives rise to the vitriolic waters (rich in copper, iron, and other sulphates) that issue from many mines, and from which copper is precipitated by cementation on metallic iron.

CHALDEA. See BABYLONIA.

CHALFONT, a village in the county of Bucks, 3 miles S.E. of Amersham. It is remarkable as the burial-place of William Penn, and as the place where Milton finished his "Paradise Lost." Population, 2720.

CHALK, in geology, is the name applied to an earthy rock made up of a vast accumulation of shells of Foraminifera. It is composed of almost pure carbonate of lime, containing as much as 94 or 98 per cent. of that material, with only a trace of silica and alumina. The term is sometimes used synonymously with carbonate of lime. The rock is usually pure white and friable, but locally it is sometimes coloured, as the red chalk of Norfolk. In the north of Ireland it is a hard deposit—the white limestone of Antrim—having been indurated by the overlying basalt.

The chalk formation covers at the top of the CRETACEOUS SYSTEM in the eastern hemisphere, and is supposed to have spread originally from Antrim to China, and from the south of Sweden to Portugal; in some places it exceeds 1000 feet in thickness. The subdivision of upper cretaceous—which was a period of gradual subsidence—is upon lithological data, the difference in the strata being dependent on the proximity of land to the original deposit; or these subdivisions the chalk is of common origin, and occurred when there was an absence of the ordinary sediments. It has several minor divisions:—

The *Chloritic Marl*, or passage series from the upper green sand, is a thin marly deposit speckled with green nodules, which is succeeded by—

The *Chalk Marl*, an insignificant band of argillaceous coarct at the base of the main deposit, which consists of—

The *Lower Chalk*, usually free from flints; and—

The *Upper Chalk*, containing many bands of lateritic strata, and vertical masses or "petstones."

These beds occupy the whole south-east corner of Great Britain except the small district of the Weald, from which it has been denuded, and extend in a narrow strip along the east coast as far north as Humbermouth Head; they are covered by Cretaceous rocks in the Tertiary basins of London and Hampshire; outlying patches occur in the north of Ireland under basalt; also in Aberdeenshire and the Isle of Mull similarly preserved, and considered by Professor Jukes to have originally covered large areas of the country.

The fauna is essentially marine, and closing as it does the Mesozoic epoch several types of animals are found in it for the last time. Neglecting the Foraminifera, of which it is chiefly composed, and the sponges so abundant in the fossils, we find several genera of corals, Echinodermata are very numerous, especially the Echinidea or Sea Urchins, which far exceed the Crinoids; Holaster, Micaster, Gasterites, Anachytes, and Cidaris, being most characteristic of the Asteroidea or Star-fishes, Gomaster is characteristic. Brachiopods are subordinate to the Lamellibranchiata; of the former representative genera are Rhynchonella, Terabratula and Terabratula; of the latter Inoceramus, Lima, Pecten, &c. Perhaps the most peculiar feature in the fauna is the variety of forms the Cephalopoda has assumed, besides Belemnites, Ammonites, and Nautili, the modified forms Turritas, Criceras, Scaphites, Anuloceras, Hamites, and Baculites occur. Fish and reptilian remains are not uncommon; mammalian remains have not been found, although they occur in older strata.

It is now generally recognized that the modern analogue of the chalk is the ooze accumulating in the deep parts of the Atlantic and Pacific Oceans, and it is a remarkable fact that

the Foraminifera found in both deposits are almost identical; the chalk fauna, however, shows that the seas where this formation accumulated were not very deep, nor could they have been very extensive, as the beds both to the south and north of the area are sandy, indicating proximity to land; it appears, however, from the purity of the chalk, that there must have been a great absence of mechanical sediments, and that therefore there were no large land areas in this portion of the globe. It must not be forgotten that the chalk is an exceptional deposit; in other districts rocks of this age are of quite a different character; in America they consist of sands, clays, and limestone, with, in some places, large quantities of coal.

CHALK STONES, accretions apparently of a chalky nature, deposited in gouty subjects round the joints. It is said that one of the Rothschilds, the celebrated bankers, could write on a slate with his knuckles. The substance is not, however, chalk, but urate of soda for the most part; uric acid being formed in this disease in abnormally large quantities, and readily combining with the phosphates of soda in the blood.

CHALMERS, DR. THOMAS, was born at Anstruther, in Fife, on 17th March, 1780. He was educated for the Church of Scotland at the University of St. Andrews. After leaving the university he was for about two years assistant minister in the parish of Cavers, and was then presented to the living of Kilmany, in Fifeshire. While holding this post he became a candidate for the mathematical chair in the University of Edinburgh, vacated by Professor Playfair, but withdrew from the contest at an early stage. The publication of a few of his sermons, and the contribution of his article "Christianity" to the *Edinburgh Encyclopedia*, drew attention towards him, and in July, 1815, he was translated to the Tron Church at Glasgow, where he rapidly extended his fame as an eloquent preacher, acquired the position of a leader in the church, and became an active promoter of every scheme for the moral and physical amelioration of the condition of his fellow-men. The liberal opinions which Dr. Chalmers had formed in promoting these schemes were beginning to undermine his constitution, and in November, 1823, he accepted the chair of Moral Philosophy in his alma mater, the University of St. Andrews, where he had more leisure to devote to literary pursuits. In 1826 he published a further volume on the "Christian and Civic Economy of Large Towns," a subject on which he had written while at Glasgow, and this was followed in 1827 by his treatise on the "Use and Abuse of Literary and Ecclesiastical Endowments," an able defence of endowments, which greatly increased his reputation. In November, 1828, Dr. Chalmers was transferred to the chair of Theology at Edinburgh, and by his lectures there exerted great influence on the minds of the students, and inspired them with the same earnest religious spirit which characterized his whole life. In 1832 he published a treatise on political economy, a science which had long been a favourite one with him, and in the following year his Bridgewater treatise "On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man." These works procured him great literary honours. He was elected, in 1831, a member of the Royal Society of Edinburgh, and also a corresponding member of the Royal Institute of France, while in 1835 the degree of D.C.L. was conferred on him by the University of Oxford. In 1831, on the death of Dr. Andrew Thomson, long the leader of the evangelical party, the General Assembly appointed Dr. Chalmers head of the Church Extension Committee, and though failing to obtain a grant from the then Whig government, he succeeded before his resignation in 1841, after years of enthusiastic labour, in obtaining contributions to the amount of over £300,000, by which 220 new churches were built. Meanwhile the question of patronage, as affecting the power

which the supreme ecclesiastical court claimed in the appointment of ministers, was creating divisions in the church itself. The evangelical party, which was predominant at this time, maintained the right of the General Assembly to see that "no minister shall be intruded into any parish contrary to the will of the congregation," and this power had been exercised to the extent of setting aside the nominee of the patron, and the civil courts had refused to interfere. The latter, however, now claimed the right not only to regulate the destination of the benefice, but to control and reverse the decisions of the church. This produced frequent collisions and caused great confusion. An appeal was made to the government in 1812, and in 1813 they decided to uphold the civil courts, and so destroyed the spiritual independence of the church.

On 18th May, 1813, rather than submit to the imposition of the civil authorities, Dr. Chalmers and 470 clergymen seceded from the General Assembly, and established the Free Church of Scotland, which elected Dr. Chalmers its first Moderator. See **FREE CHURCH**.

For a year or two he devoted himself to promoting the stability of the Free Church and in organizing a mutual **SESTENTATION FUND**. He then gradually withdrew from active public service, and devoted the rest of his life to his duties as Principal of the Free Church College, and in completing his "Institutes of Theology." He died suddenly at his house at Morningside, near Edinburgh, 31st May, 1817.

His collected works form twenty-five vols. 12mo, and a large quantity was left in MS., of which a selection, under the title of "Horæ Biblicæ," has been published since his death, under the editorship of the Rev. Dr. Hanna, his son-in-law, by whom also a biography of Dr. Chalmers has been prepared and published.

CHALMERS PORT, a town of New Zealand, the port of Dunedin, from which it is 9 miles distant. It is situated at the entrance of Otago harbour. The Otago graving-dock can take vessels of the greatest size, and is one of the largest in that part of the globe.

CHALON-SUR-SAONE, a large, ancient, and handsome town in the department of Saône-et Loire, stands on the right bank of the Saône, at the point where that river is joined by the Canal du Centre, which unites the Saône with the Loire. It is situated about 33 miles N. of Mâcon, in the centre of a vast plain covered with meadows, cultivated fields, vineyards, and copse. The finest part of the town extends along the river, the banks of which are lined with quays. The suburbs of St. Laurent is built on the left bank of the river, but is joined to the rest of the town by a magnificent stone bridge. The most remarkable objects are, the cathedral, a Gothic structure of the thirteenth century; the church of St. Pierre; the hospice of St. Laurent, founded by Francis I. in 1529; the hospital of St. Louis, situated in the suburb of Sainte Marie, and founded in 1682 as an asylum for poor old men and orphans; the obelisk, erected in 1793 to commemorate the opening of the Canal du Centre; and the public library. The Place de Beaune is a handsome square, in the centre of which there is a beautiful fountain surmounted by a statue of Neptune. The town has tribunals of first instance and of commerce, an exchange and chamber of commerce, a college, and a new corn-market. Hats, vinegar, oil, imitation pearls, in which "essence d'orient," a preparation from the scales of the bleak (the *Cyprinus alburnus*), is used, and pottery are the chief articles of manufacture. There are also dye-houses, iron foundries, and oil and flour mills worked by steam machinery. Corn, flour, wine, colonial products, cattle, wool, fuel-wood for Lyons, coal, charcoal, iron, plaster of Paris, tiles, bitumen, and the manufactures both of the north and south of France, enter into the commerce of the town; but it has suffered somewhat in its inland navigation since the opening of the railway to Lyons, from

which it is 77 miles N. Châlon has a population of nearly 20,000. The town is very ancient, and is the *Cabillonum* of Caesar. It was for some time the capital of Burgundy. It suffered severely during the civil wars of the sixteenth century, and not a little from the invasion of the allies in 1814. It was formerly very unhealthy; but in this respect it has been materially improved by the better drainage of the surrounding country, and the greater attention paid to cleanliness in the town, though in both these respects it might still be very considerably improved. The famous Abelard died in 1142 at the Abaye of St. Marcel, about 2 miles distant, and was buried here, but his remains have since been removed to Pere-la-Chaise, Paris.

CHALONS-SUR-MARNE (the ancient *Duro Catallanum*), the capital of the department of Marne in France, stands on the right bank of the Marne, 105 miles E. from Paris, and had 17,500 inhabitants in 1882. It is situated among meadows watered by the Marne, which is here crossed by a fine stone bridge. The town was formerly surrounded by ramparts, now almost entirely demolished, and entered by six gates, one of which, on the road leading to Vitry, has the form of a triumphal arch. The town is badly built, but contains some fine structures, among which the cathedral of St. Etienne, the churches of Notre Dame, belonging to the twelfth century, St. Alpin, St. Jean, and St. Loup, the town-house, the former Benedictine abbey, now converted into barracks, and the residence of the prefect of the department, which is one of the finest edifices of its kind in France. Other remarkable objects at Châlons are, the theatre, the college, the public library, containing 20,000 volumes, the royal school of arts and trades, the cabinet of natural history, the botanical gardens, and the magnificent promenade, called *Jard*, which is on the east side of the town, and covers an area of 19 acres. The town is the seat of a bishop, whose see comprises the department of Marne, with the exception of the arrondissement of Reims. It has tribunals of first instance and of commerce, and two ecclesiastical seminaries. Châlons had formerly an extensive manufacture of a kind of worsted cloth, which took its name from the town, and the word has since become corrupted into "Shalloon." The chief articles of commerce are corn, hemp, wool, rapeseed oil, and Champagne wine. The galleries for storing the latter are said to extend for 6 miles through the chalk rock. Near the town there formerly existed the most important military camp in France; but it was destroyed by Marshal Ma Mahon before commencing the manoeuvres which ended so disastrously in the capitulation of Sedan, August, 1870. A large intrenched camp at Châlons subsequently formed part of the scheme proposed for the defence of the country in the event of any future invasion. In the vicinity the little chapel of St. Pudentienne is visited by about 50,000 pilgrims in May of each year, and the church of Notre Dame de l'Épine, founded about 1329, is a most beautiful specimen of Gothic architecture. Châlons is an ancient city, having been fortified and improved by the Romans. It embraced Christianity A.D. 250. Near the city, on the way to Reims, was fought, A.D. 451, the great battle in which the Mongol Attila, leader of the Huns, was defeated by the Roman general Etius and Theoderic, king of the Visigoths, with a loss on both sides unequalled in the annals of war, except in the defeat of the Saracens by Charles Martel on the plains of Poitiers. The king himself was found among the slain. St. Bernard preached the crusade here before Louis VII. in 1147. From 1119 to 1430 the town suffered repeatedly from the attacks of the English in their efforts to retain their hold of France. In 1591 and 1592 it burned the bulls of Popes Gregory XIV. and Clement VIII. against Henry IV. In 1814 it was for a while the central point of the operations of Napoleon.

CHALYBEATE SPRINGS (from Gr. *chalups*, steel) contain iron in solution either as sulphate or as carbonate.

Where the iron exists as sulphate it has been derived from the decomposition of the pyrites in the rocks through which the waters have percolated, but on exposure to the atmosphere the iron is oxidized, and a certain proportion deposited. Carbonate of iron (FeCO_3) is soluble in waters containing dissolved carbonic acid similarly to carbonate of lime (see **CALCAREOUS SPRINGS**), although to a less extent; but it is a very unstable salt, and on exposure rapidly undergoes decomposition, the carbonic acid escaping and ferric hydrate separating.

Cold chalybeate waters, with proper appliances for their employment, are not very numerous in Britain. Tunbridge, Harrogate, and Holywell, in England and Wales; and Hattfeld, Peterhead, Dunblane, and Bonnington near Edinburgh, and Lisdoonvarna, Clare, in Ireland, are the chief. Chalybeate waters may either be employed internally, or externally in the form of baths; the former mode is the most common in this country. The use of chalybeate waters possesses many advantages over the other modes of administering iron, and not only enables many to employ this metal, but likewise to persevere with it for a much longer time. The persons who require chalybeate waters are those who find it difficult to improve their constitution and remove a tendency to disease, or convalescents from acute disease, or persons who have been debilitated either by a residence in a warm climate or by severe mental exertions. Persons of a delicate habit can rarely use them without undergoing some popular or treatment.

CHALYBITE (from Gr. *Challos*, workers in iron who live on the borders of the Black Sea, mentioned by Herodotus, and *lybos*) is also called *Siderite*, and *Spathic* or *Spathic Iron Ore*. It is one of the most important ores of iron, because of its purity, being in general free from such extraneous substances as phosphorus or sulphur. It is the carbonate of iron (FeCO_3), and crystallizes in the rhombohedral system as rhombohedrons, very similar to dolomite, but the faces of the crystals are in general covered with a siliceous incrustation and granulation. The hardness varies from 3 to 4.5; specific gravity from 3.7 to 4. The colour may vary from a pale yellowish to brownish red; lustrous, or vitreous. Chalybite often contains a large percentage of manganese and lime, thus passing into Dolomite and Carbonate, though Brown Spar and Bitter Spar. The more frequent varieties are specially valuable for the production of spiegeleisen, a hard crystalline iron containing a large percentage of manganese and carbon that is extensively employed in making Bessemer steel.

CHAMÆOPS, a genus of PALM, in which is comprised the most northern species of these remarkable vegetation, and as such is so frequently in the tropics. *Chamæops humilis*, the European species, grows to a tree to the height of 15 feet, but in Spain and Italy it is not more than 4 or 5 feet high, and in Italy it is much smaller. It is common upon the hills of Algeria. It occurs in many places in the southern part of Prussia, and reaches its northern limits in the Caucasus. The trunk of this plant is 5 or 6 inches in diameter, and is closely covered with triangular hard scales, which are the bases of the old leaves. The new leaves are a tuft at the top of the stem, and have small petioles, with rigid spars proceeding from the edges. *Chamæops Portuensis*, the only other species, is a native of Crete. Both species furnish a coarse kind of paper obtained from the bases of the leaves.

The genus *Chamæops* belongs to the tribe Corypheæ. It is distinguished from dried palms of this tribe by the flowers being polyandrous, the staminate and perfect flowers occurring on the same or different spikes; the petals are imbricated; the cupels free, with distinct sessile stigmas, which remain firm in the fruit; the albumen is granulated; the embryo dorsal; and the primary branches of the species are born at the base.

CHAMBER MUSIC is the term which designates compositions for a small number of instruments, so that they may be played in a chamber, as distinct from orchestral, cathedral, or operative works. Strictly speaking, songs, or vocal concerted music for a small body of performers, may be considered chamber music; but the term is always understood to be limited to instrumental works. The duet, trio, quartet, quintet, and rarely the septet (as Hummel, Beethoven, &c.), or even ottet (as Mendelssohn), of stringed instruments, or strings and pianoforte, or with a few wind instruments added to strings, are the well-known and dearly-loved divisions of chamber music. All the great composers have written works of this class, and indeed many of the grandest conceptions in music are worked out in this delicate manner. The celebrated Monday Popular Concerts of London, which are appreciated more than ever, though they began so long ago as 1859, are entirely supplied with this class of music, in its widest sense—that is, including pianoforte music and instrumental and vocal solos.

CHAMBER OF COMMERCE, an association of merchants and others for the promotion and benefit of trade. Such bodies originated at Marseilles, France, about the end of the fourteenth or the beginning of the fifteenth century, and at first were invested with remarkable powers. That of Marseilles shared in the municipal jurisdiction and in the administration of justice in mercantile questions. At Dunkirk a chamber of commerce was established in 1700, and in the same year a council-general of commerce was instituted at Paris, comprising six councillors of state and twelve mercantile men delegated from the principal towns of the kingdom. The numerous chambers of commerce which had arisen by the time of the Revolution were all suppressed by the National Assembly in 1791, but re-established by a circular edict in 1802. They have a semi-official position in France, their organization being regulated by the ordinances of September, 1851, and August, 1852. Their province is to advise the government on all industrial and commercial subjects, including the execution of any public works having for their object the furtherance of trade. In most other countries of continental Europe there are similar institutions for the purpose of conveying information and advice to the central government in matters affecting commercial interests.

The United Kingdom was slow to adopt the institution, the first town to do so being Glasgow, where a chamber of commerce was established in 1783. The Edinburgh chamber, instituted in 1780, has the distinction of being the first public body in the country to petition Parliament for the abolition of the corn laws and for the adoption of free-trade principles. It also initiated the movement which resulted in the telegraph service being taken over by the state. The Manchester Chamber of Commerce established in 1820, has also a history distinguished for great and successful efforts in the free-trade cause. There are similar institutions in several large towns, such as Hull, Liverpool, Bradford, Leeds, and within the last few years in London also; but the rapidity of their growth in the United Kingdom has not been such as might almost have been expected from the large extent of the trading and manufacturing interests concerned.

In the United Kingdom chambers of commerce have no official connection whatever with the government, but are purely voluntary associations in the interests of trade and commerce. They endeavour to promote these by—(1) Representing and urging on the legislature the views of their members in mercantile affairs; (2) aiding in the preparation of legislative measures having reference to trade; and (3) collecting statistics bearing upon the staple trade of their district. Occasionally a chamber acts as a sort of court of arbitration in mercantile questions. In 1860 there was established an Association of Chambers of Commerce of the United Kingdom.

CHAMBERLAIN (Lat. *custos cubiculi*, or *cubicularius*, keeper of the chamber). Cubicularius was the Roman name for a slave whose business was to look after the rooms or chambers in the house, introduce visitors, and the like. Under the emperors the cubicularii were officers in the imperial household, and were called the "*cubicularii sacri cubiculi*," the chamberlains of the imperial chamber ("Cod." xii. tit. 5). This office, like many others in royal households, is derived from the usages of the later Roman empire. The word chamber (Fr. *chambre*) is from the Latin *camera*.

The office of lord high chamberlain of England was once one of the highest dignity. The duties of the high chamberlain are - the dressing and attending on the king at his coronation; the providing of furniture for the Houses of Parliament, and for Westminster Hall when used on great occasions; and attendance upon peers at their creation, and upon bishops when they perform their homage.

The lord chamberlain of the king's household has the control of all parts of the household (except over the ladies of the queen's bed-chamber) which are not under the direction of the lord steward, the groom of the stole, or the master of the horse. The king's chaplains, physicians, surgeons, &c., as well as the royal tradesmen, are by his appointment. All persons desiring to be presented at levees or drawing-rooms require to send their cards to the lord chamberlain, and it is his duty to see that the persons applying are entitled by station and character to be presented to the sovereign. The lord chamberlain also issues invitations to state balls, parties, &c. His salary is £2000 a year, and his tenure of office depends upon that of the political party to which he belongs. The lord chamberlain is licenser of plays, and one of the officers in his department is styled Examiner of Plays. The vice-chamberlain is the deputy and assistant of the lord chamberlain, and is likewise appointed by the ministry for the time being.

The chamberlain of the city of London is an officer elected by the freemen who are liverymen. The duties of the chamberlain are judicial and administrative. He admits on oath all persons entitled to the freedom of the city, and hears and determines all matters of complaint between masters and apprentices. The chamberlain is the treasurer of the city of London. His fixed annual income is £2000, levied from the profits of balances of the corporation money and public funds retained in his hands.

● **CHAMBERS, EPHRAIM**, was born at Kendal in the latter part of the seventeenth century. While yet an apprentice to a globemaker in London he conceived the design of the Cyclopædia which has chiefly preserved his name. The first edition of the Cyclopædia appeared in two vols. folio in 1728, and was very favourably received. It was published by subscription, the price of each copy being four guineas. A second edition appeared in 1738, and a third in 1739. Chambers was engaged in several other literary undertakings, but none of any celebrity. He died on 18th May, 1740, at Canonbury House, Islington. Several editions of his Cyclopædia, with additions, have been published since his death, and it is avowedly the basis of the greatly more extended Cyclopædia which Dr. Rees afterwards undertook, and which he lived to complete in forty-five vols. 4to. Indeed, it may be said to have originated all the modern cyclopædias, both in the English and in other European languages.

CHAMBERY, the capital of the department of Savoy, France, stands in a fine valley, between two ridges which run from the Rhone to the Isère, 46 miles S.S.W. of Geneva. The valley is watered by the Leisse, which falls into the Lake of Bourget, 8 miles N.W. of Chambery. Chambery is the seat of an archbishopric, has a cathedral dating from the fourteenth and fifteenth centuries, an imperial college, an academy of science, a public library containing 16,000 volumes, a theatre, three barracks, and a school of design.

There are many hospitals and charitable institutions. The population in 1883 was 16,000. Besides gauze, other silk fabrics, lace, hats, leather, and soap are manufactured; and there is some trade in liquors, wines, lead, copper, and various other articles. The environs abound in vineyards, woods, and picturesque scenery. Near Chambery is the country-house of Les Charmettes, once the residence of Madame de Warens and Rousseau. The city is supposed to stand near, though not upon, the site of the ancient *Lemincum*. It was taken by the French in 1792, who made it the capital of the department of Mont Blanc, and retained it till the second treaty of Paris, in November, 1815, when it was made over to the King of Sardinia, who, however, gave it up, together with the whole province of Savoy, to France, in the year 1861. Chambery was the birthplace of Vaugelas, Saint Real, and the brothers Joseph and Xavier de Maistre.

CHAMBOARD, THE COMTE DE, the last of the long line of Bourbon kings of France. To the Legitimist, he was Henri Cinq, he who terminated the line which Henri Quatre began; to the rest of the world he was Henri Charles Ferdinand Marie Dieudonné d'Artois, Comte de Chambord and Duc de Bordeaux. After Waterloo the brother of the unfortunate Louis XVI. was restored to the throne of France. He was also a Louis (Louis Stanislaus Xavier, count of Provence), and reigned as Louis XVIII., the poor little prince so miserably treated during the Revolution fighting as the seventeenth Louis in the two years which elapsed between his father's death on the scaffold and his own in prison. As the two chief brothers left no children, their brother Charles-Philippe, count d'Artois, succeeded as Charles X. His arbitrary conduct brought about the revolution of 1830, which placed the Orleans family on the throne in the person of Louis-Philippe. At this time Charles X. had two sons - the dauphin (Duc d'Angoulême), who died afterwards in 1814, leaving no son; and the Duc de Berri, murdered 18th February, 1820. But to the latter a posthumous son was born as late as 29th September in the same year. So very extraordinary an occurrence seemed to show no doubts in interposition of providence to preserve the fast fading line of Bourbon, and the child was named by common consent "*l'enfant de miracle*" (the miraculous baby). Chamberlain brought water from the Jordan when with baptize the little Duc de Bordeaux, and the Castle of Chambord was bought for him by public subscription; but in ten years from his birth he and his family were exiles from France. Charles X., when abdicating, did so in favour of the Duc de Bordeaux, and the dauphin joined in the abdication; but that solution of the difficulty was not received. In 1814 the Comte de Chambord, as he now came to be called, was residing in London, in Belgrave Square, after a prolonged residence in various parts of the Continent completing his education, and here he held a sort of court, the French Legitimists making open parade of attending it. The Duc d'Angoulême had died, and he was now head of the house. In 1816 the comte married Maria Theresa, daughter of the Duke of Modena, but they never had issue. He resided frequently at Venice. In 1870 he came to the Swiss frontier and promised to expel the foreigner if the people would rally round him and restore her true government to France. Various other proclamations were issued from time to time with equal want of success. After the capitulation of Paris the comte returned to France for a time and resided at Chambord, whence in 1871 he issued a proclamation styling himself for the first time "*Henry V.*" He even visited Paris, and there is great reason for thinking that if he had given way to established facts in a reasonable manner a Bourbon would once more have been king of France. But upon such trifles as refusing to recognize the tricolor flag, &c., "*the king*" was absolute - "*Frenchmen! Henry V. cannot*

abandon the white flag of Henry IV." But whether by design or from inability to comprehend what passed around him, he showed so complete an antagonism to the general feelings of France that it was clear he never could be allowed to reign. Feeling this himself, he had the good sense to retire voluntarily, so that the country might not suffer agitation by his fault, and lived quietly at Geneva and Lucerne for some time. In February, 1872, he repaired to Antwerp, there to hold a sort of court, and to receive (but only to decline) a scheme of monarchical government proposed by 280 members of Parliament. After this the Comte de Chambord retired to the Castle of

Frohsdorf, not far from Vienna, occasionally issuing a manifesto or a public letter, receiving deputies from the right in Parliament, or accepting the homage of the Orleans princes. In a year or two he began to withdraw more and more from the public view, and was hardly heard of for several years before his death. He died 24th August, 1883, at Frohsdorf, a castle left to him by his aunt, the Duchesse d'Angoulême, who had bought it from the Princess Caroline Bonaparte. His funeral was attended by a body of French Royalists numbering about 5000. By his death the Legitimist and Orleanist sections of French Royalists are re-united.

END OF VOL. III.

